Of Lines.

ones being always next to that of the blue ones. Vair is usually of six rows; if there be more or fewer, the number ought to be expressed; and if the colours are different from those above mentioned, they must likewise be expressed.

The English multiply the furs, as well as the names of the tinctures, though no other nation has adopted such varieties. Thus they give us,

1. *White*, which is the natural colour of the ermine; but it is used on no other occasion but in the descriptions of mantles.

2. *Ermines*, which is the same with contra-ermine.

3. *Erminois*; the field is Or, the powdering Sable, (N° 13.). For the use of this fur Guillim cites Bara, p. 14.; but no such fur is to be found in Bara.

4. *Pean*; the field is Sable, the powdering Or, (N° 14.). The French use no such term: but they call all furs or doublings *des pannes* or *pennes*; which term has possibly given rise to this mistake, and many others, in those who do not understand the French language.

5. *Erminites*; the same as Ermine, with the addition of a red hair on each side of the black. Sir George M'Kenzie calls these distinctions "but fancies, for *erminites* signifies properly *little ermines*."

6. *Counter-vair*; when the bells of the same tincture are placed base against base, and point against point, (N° 16.).

7. *Potent-counter-potent*, anciently called *Vairy-cuppy*, as when the field is filled with crutches or potents counter-placed, (N° 17.).

It may not be improper to observe, that the use of the tinctures took its rise from the several colours used by warriors whilst they were in the army, which S. de Petra Sancta proves by many citations. And because it was the custom to embroider gold and silver on silk, or silk on cloth of gold and silver, the heralds did therefore appoint, that in imitation of the clothes so embroidered, colour should never be used upon colour, nor metal upon metal.

Sect. III. *Of the Lines used in the parting of Fields.*

Escutcheons are either of one tincture, or more than one. Those that are of one only, that is, when some metal, colour, or fur, is spread all over the surface or field, such a tincture is said to be predominant: but in such as have on them more than one, as most have, the field is divided by lines; which, according to their divers forms, receive various names.

Lines may be either straight or crooked. Straight lines are carried evenly through the escutcheon: and are of four different kinds; viz. a perpendicular line |; a horizontal, —; a diagonal dexter, \; a diagonal sinister, /.

Crooked lines are those which are carried unevenly through the escutcheon with rising and falling. French armorists reckon 11 different sorts of them; Guillim admits of 7 only; but there are 14 distinct kinds, the figures and names of which are as in fig. 1. (A), N° 1—14. viz.

Of Lines.

1. The engrailed. 2. The invected. 3. The wavy. 4. The embattled, or crenelle. 5. The nebule. 6. The raguly. 7. The indented. 8. The dancette. 9. The dove-tail. 10. The grafted. 11. The embattled aronde. 12. The battled embattled. 13. The patee or dovetail. 14. Champaine.

The principal reason why lines are thus used in heraldry, is to difference bearings which would be otherwise the same; for an escutcheon charged with a chief engrailed, differs from one charged with a chief wavy, as much as if the one bore a cross and the other a saltier.

As the fore-mentioned lines serve to divide the field, it must be observed, that if the division consists of two equal parts made by the perpendicular line, it is called *parted per pale*; by the horizontal line, *parted per fess*; by the diagonal dexter, *parted per bend*; by the diagonal sinister, *parted per bend sinister*; examples of which will be given in the sequel of this treatise.

If a field is divided into four equal parts by any of these lines, it is said to be *quartered*; which may be done two ways, viz.

Quartered or parted *per cross*; which is made by a perpendicular and horizontal line, which, crossing each other at the centre of the field, divide it into four equal parts called *quarters*. See Plate CCLIV. under fig. 1. (A).

Quartered or parted *per saltier*; which is made by two diagonal lines, dexter and sinister, that cross one another in the centre of the field, and likewise divide it into four equal parts. *Ibid.*

The escutcheon is sometimes divided into a greater number of parts, in order to place in it the arms of the several families to which one is allied; and in this case it is called a *genealogical atchievement*. These divisions may consist of 6, 8, 12, and 16, quarters [as under fig. 1. (A)], and even sometimes of 20, 32, 64, and upwards; there being examples of such divisions frequently exhibited at pompous funerals. An extraordinary instance of this kind was exhibited at the pompous funeral of the Viscountess Townshend, whose corpse was brought from Dublin castle in Ireland to Rainham-hall in Norfolk, one of the principal tenants on horseback carrying before the hearse a genealogical banner, containing the quarterings of his lordship's and her ladyship's family, to the amount of upwards of 160 coats. Sir George Booth, rector of the valuable living of Ashton under Line, bears six distinct coats of arms in his shield; viz. those for Booth, Barton, Venables, Mountfort, Ashton, Egerton; and has besides a right to 37 other coats: but Sir William Dugdale very justly objects to so many arms being clustered together in one shield or banner, on account of the difficulty of knowing and distinguishing one coat of arms from another.

(A) Bordures are still introduced into English coats of arms, but for particular reasons, which heralds can best explain. They are by the French frequently taken for a principal figure, and numbered among the rest of the ordinaries.

Of Differences.

SECT. IV. *Of the Differences of Coats of Arms.*

ARMORISTS have invented divers differences or characteristical marks, whereby bearers of the same coat of arms are distinguished each from others, and their nearness to the principal bearer demonstrated. According to J. Guillim, these differences are to be considered either as ancient or modern.

ART. I. OF ANCIENT DIFFERENCES.

Those he calls *ancient differences* consist in *bordures* (A); which is a bearing that goes all round, and parallel to the boundary of the escutcheon, in form of a hem, and always contains a fifth part of the field in breadth. Bordures were used in ancient times for the distinguishing not only of one nation or tribe from another, but also to note a diversity between particular persons descended of one family and from the same parents. This distinction, however, was not expressly signified by invariable marks; nor were bordures always appropriated to denote the different degrees of consanguinity; for, as Sir Henry Spelman observes in his *Aspilogia*, p. 140, ancient heralds, being fond of perspicuous differences, often inverted the paternal tincture, or sometimes inserted another charge in the escutcheon, such as bends, croslets, cantons, or the like; which irregularity has, I suppose, induced modern armorists to invent and make use of others."

Plate CCLV. There are bordures of different forms and tinctures, as in the examples, fig. 3.

N° 1. is "Sable, a Bordure Argent; borne by the right hon. Sackville Tufton, earl of Thanet.—When a bordure is plain, you are not to mention it, as it is always understood so in heraldry, though it be not expressed; but if it has any other form, you are to signify it.

2. "Gules, a Bordure engrailed Argent;" borne by the right hon. Charles Gray, Lord Gray.—This is called *engrailed*, from the French word *engrêlé*, which signifies a thing the hail has fallen upon and broken off the edges, leaving it with little semicircles struck out of it.

3. "Gules, a Bordure engrailed Or:" borne by the right hon. George Talbot, earl of Shrewsbury. You must observe, that in a bordure or ordinary formed of these lines, the points are represented on all sides towards the field, and the semicircles turned towards the bordure or ordinary.

4. "Argent, a Bordure invected Azure."—This is quite contrary to the last; for as the other turns its points from the bordure into the field, so contrarywise this does, by the inversion of the points from the field into the bordure. Such a charge or any other formed of these lines is seldom to be met with in English coats of arms.

5. "Gules, a Bordure indented Argent."—The word *indented* requires very little explanation, the signification being obvious to all persons, from its figure, which is composed of tracks resembling teeth, called in Latin *dentes*.

6. "Azure, a Bordure Ermine."

7. "Vert, a Bordure Vair."

8. "Ermine, a Bordure company, or gobony, Or and Sable."—This is so termed from its being composed of small and equal pieces. J. Guillim calls this bordure *gobonated*, which implies the same meaning; but the word being obsolete, is not used by modern heralds.

Ancient Differences.

9. "Quarterly, Azure and Gules, a bordure compony Argent and Azure;" borne by his grace Henry Somerset, duke of Beaufort, &c.

10. "Azure, a Bordure counter-compony Argent and Gules."—Observe, that the counter-compony does always consist of two tracks and no more.

11. "Or, a bordure checky Argent and Sable."—This has a great resemblance with the last bordure, having only one track more; therefore you must take care, before you blazon, to number them, or else you may easily err in taking the one for the other.

12. "Gules, a Bordure Argent, charged with eight Trefoils slipped proper, that is, Vert."—All nations use few terms in blazoning bordures; but English armorists, in order possibly to raise the dignity of this science, have perplexed it, and rendered it unintelligible to all foreigners, by introducing into it several mystical proper names, among which may be reckoned the following ones, viz. They call a bordure, if charged with eight plants, fruits, flowers, or leaves, *verdoy* of such vegetables; or *enaluron* of such birds; *enurny* of beasts; *perflew* of furs; and *entoyre* of inanimate things of what kind soever.

13. "Gules on a Bordure Azure, eight Stars Or."

14. "Argent, a Bordure compony of the last and Gules, the first charged with Roses of the second, barbed and seeded proper." This bordure is borne by his grace Charles Lenox duke of Richmond, &c.

15. "Ermine, with a Bordure engrailed Gules;" the coat of arms of the right hon. Henry-Benedict Barnewall, Viscount Kingsland, &c. of Ireland.—This ancient and noble family is of French extraction, and allied to the dukes of Little-Bretagne, where the name continues still in great repute.

16. "Argent, a Bordure Sable charged with eight Besants;" borne by the right hon. ——— Cole, Lord Ranelagh, of Ireland.

17. "Party per pale Argent and Gules, a Bordure charged with eight Escalops counterchanged;" the coat of arms of the right hon. William Maule, earl of Panmure, &c. of Ireland. This very ancient family is originally French, and derives its surname from the town and lordship of Maule in Normandy, where the same arms are still to be seen in the parish-church.

17. "Azure, a Bordure quarterly, the first and fourth Ermine, the second and third counter-compony Argent and Azure."

19. "Purpure, a Bordure compony Or and Gules, each of the last charged with a Besant."

20. "Quarterly Or and Gules, within a Bordure Vert, charged with eight Escalops Or."

We shall conclude this head with observing, that a bordure is never of metal upon metal, and seldom of colour upon colour, but rather of the tincture which the principal bearing or charge is of. Thus Sir ——— Dalziel of Glenae, whose predecessor was a younger brother of the noble family of Carnwath, has, within a Bordure Argent, the paternal coat of the ancient name of Dalziel, viz. "Sable, a hanged man with his arms extended, Argent;" formerly they carried him hanging

Modern Differences.

hanging on a gallows. This bearing, though so very singular for a coat of arms, was given as a reward to one of the anceſtors of the late Robert Dalziel, earl of Carnwath, to perpetuate the memory of a brave and hazardous exploit performed, in taking down from a gallows the body of a favourite and near relation of King Kenneth II. hung up by the Picts; which ſtory is thus related by Alexander Niſbet: "The king being exceedingly grieved that the body of his minion and kinſman ſhould be ſo diſgracefully treated, he proffered a great reward to any of his ſubjects who would adventure to reſcue his corpſe from the diſgrace his cruel enemies had unjuſtly put upon it: but when none would undertake this hazardous enterpriſe, at laſt a valorous gentleman came and ſaid to the king, *Dalziel*, which ſignifies; "I dare;" and he did actually perform that noble exploit to the king's ſatisfaction and his own immortal honour, and in memory of it got the aforeſaid remarkable bearing: and afterwards his poſterity took the word *Dalziel* for their ſurname, and the interpretation of it, *I dare*, continues even to this day to be the motto of that noble family." We can have no better proof of the truth of this tradition than this, that the heads of this ancient family have for many ages carefully retained this bearing without any alteration or addition.

Art. 2. Of Modern Differences.

The modern differences which the Engliſh have adopted not only for the diſtinguiſhing of ſons iſſued out of one family, but alſo to denote the difference and ſubordinate degrees in each houſe from the original anceſtors, are nine, viz.

Plate CCLIV. under fig. 1. (A).

For the heir or firſt ſon, the Label; 2d ſon, the Creſcent; 3d ſon, the Mullet; 4th ſon, the Martlet; 5th ſon, the Annulet; 6th ſon, the Flower-de-luce; 7th ſon, the Roſe; 8th ſon, the Croſs moline; 9th ſon, the Double Quater-foil.

By theſe differences, the ſix ſons of Thomas Beauchamp, the 15th earl of Warwick, who died in the 34th year of King Edward III. are diſtinguiſhed in an old window of the church of St Mary at Warwick; ſo that although they are called *modern differences*, their uſage with the Engliſh is ancient.

It muſt be obſerved, that, of all the forementioned marks of diſtinction, none but the label is affixed on the coats of arms belonging to any of the royal family; which the introducers of this peculiarity have, however, thought proper to diſtinguiſh by additional pendants and diſtinct charges on them.

As to the diſtinction to be made in the arms of the offspring belonging to each of the above-mentioned brothers, it is expreſſed by figures on the top and margin of the table contained in fig. 4. For inſtance, The heir or firſt ſon of the ſecond houſe, beareth a creſcent charged with a label during his father's life only. The ſecond ſon of the ſecond houſe, a creſcent charged with another creſcent. The third ſon of the ſecond houſe, a creſcent charged with a mullet. The fourth ſon of the ſecond houſe, a creſcent charged with a martlet. The fifth ſon of the ſecond houſe, a creſcent charged with an annulet. The ſixth ſon of the ſecond houſe, a creſcent charged with a flower-de-luce; and ſo on of the other ſons, taking care to have them of a different tincture.

Plate CCLV.

Modern Differences.

In what part of the eſcutcheon theſe differences ſhould be borne is not certain; for Guillim, Morgan, and others, give us many different examples of their poſition. The honour-point would be the propereſt place, if the arms would admit of it; but that is not always the caſe, as that part may be charged with ſome figure in the paternal coat, which cannot with propriety receive the difference. There are inſtances where theſe are borne as perfect coats of arms, as the examples ſubjoined to the Table of Houſes ſufficiently ſhow; which are to be blazoned thus:

The firſt is "Azure, a Label Argent."—When ſuch a label is borne as a difference, the pendants, according to G. Leigh, ſignify that he is but the third perſon; the dexter pendant referring to his father, the ſiniſter to his mother, and the middle one to himſelf.

The ſecond is "Argent, a Label of fine points Azure;" borne by the name of Hentington. If a label has more or leſs than three pendants or points, they are to be expreſſed as in the foregoing example

The third is "Azure, a Creſcent Argent," borne by the name of Lucy.—The reaſon G. Leigh aſſigns for the ſecond ſon's having a creſcent for a difference is to ſhow that he ſhould increaſe the family by adding to it riches and reputation.

The fourth is "Argent, a Mullet Sable, on a Chief Azure, a Fleur-de-lis Or;" borne by the name of Rogers, in Glouceſterſhire.—A mullet or ſpur was appointed for the third ſon's difference, as the laſt mentioned author ſays, to ſhow that he ſhould follow chivalry.

The fifth is "Azure, a Fleur-de-lis Argent;" borne by the right hon. Henry Digby, Baron Digby of Geaſhil, in King's county, Ireland.

Theſe few examples, among many more that might be given, demonſtrate the impropriety of adopting theſe *modern differences*, as they are called, for marks of cadency to diſtinguiſh the different branches of a family: for it is impoſſible to diſtinguiſh the uncle or grand-uncle, from the nephew, or grand-nephew, if each of them are ſecond, third, or fourth ſons; and in the courſe of ſucceſſion theſe differences would multiply to ſuch a number, that it would be impoſſible to delineate them diſtinctly in moſt caſes. But as they are given by moſt of the Engliſh writers on heraldry, though no foreign nation uſes them, it was thought proper to inſert them here.

Siſters, except of the blood-royal, have no other mark of difference in their coats of arms, but the form of the eſcutcheon (as obſerved before); therefore they are permitted to bear the arms of their father, even as the eldeſt ſon does after his father's deceaſe. The reaſon of which is by Guillim ſaid to be, that when they are married, they loſe their ſurname, and receive that of their huſbands.

Next to theſe diminutions, G. Leigh, J. Guillim, and after them Dr Harris in his *Lexicon Technicum*, ſet forth at large divers figures, which they pretend were formerly added to the coats of ſuch as were to be puniſhed and branded for cowardice, fornication, ſlander, adultery, treaſon, or murder, for which they give them the name of *abatements of honour*; but as they produce but one inſtance of ſuch whimſical bearings, we have not inſerted them here. Beſides, arms

Honourable Ordinaries.

being marks of honour, they cannot admit of any note of infamy; nor would any body now-a-days bear them if they were ſo branded. It is true, a man may be degraded for divers crimes, particularly high treaſon; but in ſuch caſes the eſcutcheon is reverſed, trod upon, and torn in pieces, to denote a total extinction and ſuppreſſion of the honour and dignity of the perſon to whom it belonged.

Chap. III. *Of the Charges.*

Armorists call a charge whatſoever is contained in the field, whether it occupy the whole or only a part thereof. All charges are diſtinguiſhed by the names of *honourable ordinaries*, *ſub-ordinaries*, and *common charges.*

Honourable ordinaries, the principal charges in heraldry, are made of lines only, which, according to their diſpoſition and form, receive different names.

Sub-ordinaries are ancient heraldic figures, frequently uſed in coats of arms, and which are diſtinguiſhed by terms appropriated to each of them.

Common charges are compoſed of natural, artificial, and even chimerical things; ſuch as planets, creatures, vegetables, inſtruments, &c.

Sect. I. *Of Honourable Ordinaries.*

The moſt judicious armoriſts admit only of nine honourable ordinaries, viz.

The Chief	The Bar
The Pale	The Cheveron
The Bend	The Croſs
The Bend ſiniſter	and
The Feſs	The Saltier.

Of theſe, but ſix have diminutives, which are called as follows: That of the chief is a *fillet;* the pale has a *pallet* and *endorſe;* the bend, a *bendlet*, *coſt*, and *ribband;* the bend ſiniſter has the *ſcarp*, and *bâton;* the bar, the *cloſet* and *barulet;* the cheveron, a *chevronel* and *couplecloſe.* All which will be treated of in their order.

Art. 1. Of the Chief.

The chief is an ordinary determined by an horizontal line, which, if it is of any other form but ſtraight, muſt be expreſſed. It is placed in the upper part of the eſcutcheon, and containeth in depth the third part of the field. Its diminutive is a fillet, the content of which is not to exceed one fourth of the chief, and ſtandeth in the loweſt part thereof. This ordinary is ſubject to be charged with variety of figures; and may be indented, wavy, nebule, &c. as in the examples, fig. 5.

Plate CCLV.

N° 1. is "Or, a Chief indented Azure;" borne by the right hon. Edmund Butler, Viſcount Mountgarret, &c. of the kingdom of Ireland. This great and illuſtrious family of the Butlers, ſo renowned for the many valiant and loyal perſons it has produced, is deſcended from the ancient counts of Brion in Normandy; but ſince King Henry II. conferred the office of chief butler of Ireland upon one of the family, he and his ſucceſſors have aſſumed the name of *Butler.*

2. "Azure, a Chief engrailed Or."

3. "Argent, a Chief invected Vert."

Of the Chief.

4. "Vert, a Chief undy Or."

5. "Azure, a Chief nebule Argent."

6. "Or, a Chief checky Azure and Argent."

7. "Ermine, a Chief quarterly Or and Gules;" borne by the name of Peckham.

8. "Argent, a Chief Sable, in the lower part thereof a Fillet of the Field."

6. "Azure, fretty Argent, a Chief Or;" borne by the right hon. Hayes St Leger, Viſcount Doneraile, &c. of the county of Cork in Ireland. This ancient and noble family is of French extraction; and is deſcended from Sir Robert Sent Legere, Knight, who, in 1066, accompanied William duke of Normandy in his expedition into England; and the family have a tradition, that he, with his own hand, ſupported the ſaid duke when he quitted the ſhip to land in Suſſex.

10. "Argent, on a Chief engrailed Azure, a Tortoiſe paſſant Or;" borne by the name of *Bidgood.*

11. "Argent, on a Chief Gules, two Spur revels Or; borne by the right hon. John St John, Lord St John of Bletſhoe, &c. Of this ancient family, which derive their ſurname from a place called *St John* in Normandy, was John de St John, Eſq. who having a principal employment in the army of the Norman duke, attended him in his expedition into England.

12. "Argent, on a Chief Vert, two Spears Heads erect of the Field, the points imbrued Gules;" borne by the right hon. George Brodrick, Viſcount Middleton, &c. of the kingdom of Ireland. This family is lineally deſcended from George de Brodrick, who came into England in the reign of William II.

13. "Or, on a Chief Sable, three Eſcallops of the field," for the name of *Graham;* and borne quartered in the arms of his Grace William Graham, duke, marquis, and earl of Montroſe, &c. with Argent three Roſes Gules. According to the Scots writers this great and noble family is deſcended from the renowned Greme or Grame, who in the year 404 was general of King Fergus II.'s army, and in 420 forced his way through the wall built by the Romans between the rivers Forth and Clyde to keep out the Scots from moleſting them in their poſſeſſions, and the ſaid breach has ever ſince been called *Grame's Dike.*

14. "Argent, on a Chief indented Gules, three Croſſes pattee of the Field; borne by the right hon. John Percival earl of Egmont, &c. This very ancient and noble family is ſuppoſed, from circumſtances little ſhort of poſitive proof, to have ſprung from a younger branch of the ſovereign dukes of Bretagne in France, of the ſame name. They were tranſplanted into Normandy before the conqueſt, poſſeſſed of great eſtates and power, and inveſted with the office of chief butler. Upon the Norman invaſion, two of this family came over into England with the Conqueror, from one of which the deſcent of the preſent earl of Egmont is deduced by the cleareſt and moſt indiſputable proofs of hiſtorians and records.

15. Azure, on a Chief indented Or, three Spurrevels Gules;" borne by the right hon. Charles Moore, earl of Drogheda, &c. of the kingdom of Ireland. This noble family, which is of French extraction, came into England ſoon after the conqueſt, and made their firſt

Of the Pale.

first residence in the manor of Moore-court, in the county of Kent.

16. " Ermine, on a Chief indented Azure, three ducal coronets Or ;" borne by the name of *Lytton.*

17. " Azure, on a Chief Or, three Martlets Gules," for the name of *Wray* ; and borne by Sir Cecil Wray, Bart. of Lincolnshire.

18. " Ermine, on a Chief Gules ; five Lozenges of the first ;" borne by the name of *Dixin.*

19. " Argent, fretty Gules, on a Chief of the second, three Leopards Faces Or :" borne by the right hon. Henry Liddel, Lord Ravensworth. This noble lord is descended from the ancient lords of Liddle-castle, in the county of Durham, where they have been proprietors of great coal-mines time out of mind.

20. " Ermine, a Chief party per pale Azure and Or ; on the dexter the Sun in his splendour, on the sinister a Cross pattee Gules." The arms of the bishopric of Raphoe, in the kingdom of Ireland.

Art. 2. Of the Pale.

The Pale is an ordinary, consisting of two perpendicular lines drawn from the top to the base of the escutcheon, and contains the third middle part of the field. Its diminutives are, the pallet, which is the half of the pale ; and the endorse, which is the fourth part of a pale. This ordinary and the pallet may receive any charge, but the endorse should not be charged. The endorse, besides, is never used, according to J. Leigh, but to accompany the pale in pairs, as cotices do the bend ; but Sir John Ferne is of a different opinion. fig. 6.

Plate CCLV.

Ex. 1. " Gules, a Pale Or ;" by the name of *Grandmain.*

2. " Party per Pale Argent and Gules, a Pale counterchanged.

3. " Argent, a Pale between two Endorses Gules."

4. " Party per Pale, 1st, Paly of six Argent and Sable, 2d, Azure ;" borne by the name of *Trenchard.*

5. " Paly of six Or and Azure."

6. " Argent, three Pallets undy Sable ;" by the name of *Downes.*

7. " Party per Pale, Argent and Gules ;" borne by the right honourable John Waldegrave, Earl Waldegrave, &c. This noble earl is descended from John de Waldegrave, who was sheriff of London in the year 1205, in the seventh year of King John.

8. " Party per Pale indented, Or and Gules ;" borne by the right honourable Thomas Bermingham, baron of Athenry, in the kingdom of Ireland. Of this ancient and noble family, which are of English extraction, and took their name from the town of Bermingham in the county of Warwick, was William de Bermingham, who was possessed of the town of that name in the reign of Henry II. which continued in that family till the reign of Henry VIII.

9. " Quarterly per Pale dove-tail, Gules and Or ;" borne by the right honourable Thomas Bromley, Lord Montfort, &c. This noble lord is maternally descended from Sir Walter Bromleghe of Bromleghe, in the county of Stafford, who flourished in the reign of King John. Sir Thomas Bromley, another of his lordship's ancestors, was constituted lord high chancellor of England, 21 Elizabeth ; in which post he died, 29 Elizabeth.

Of the Bend.

10. " Argent, a Pale flory counterflory Sable."

11. " Argent, a Pale lozengy Sable ;" borne by the name of *Savage.*

12. " Argent, a Pale indented Vert ;" borne by the name of *Dickson.*

" 13. " Argent, on a Pale engrailed Sable, three Crescents Or ;" borne by the name of *Ashly.*

14. " Ermine on a Pale engrailed azure, three Lion's Heads couped Or ;" borne by the name of *Avery.*

15. " Vert, on a Pale radiant Or, a Lion rampant Sable ;" borne by the right honourable James O'Hara, Lord Tyrawley, &c. in the kingdom of Ireland. This noble lord is descended from Milesius king of Spain, by his eldest son Hiberius, who, with his brother Heremon, established a colony in Ireland. Sir Charles O'Hara, father to the present lord, was created baron of Tyrawley by Queen Anne, Jan. 10. 1706, being at that time a lieutenant-general, and colonel of the royal regiment of fusileers : and the next year was made general in Spain, where this son, Lord James, was wounded at the battle of Almanza.

16. " Azure, a Pallet Argent."

17. " Vert, an Endorse Or."

18. " Argent, on two Pallets Sable, six Crosscroslets fitchy Or ;" borne by the name of *Betunes*, of the county of Salop.

19. " Argent, two Endorses Gules, in Chief three Mullets Sable ;" borne by the name of *Vautort.*

20. " Azure, on a Pale walled with three pieces on each side Or, an Endorse Sable ;" borne by the name of *Sublet de Noyers*, a family of distinction in France.

Art. 3. Of the Bend and Bend-sinister.

The bend is an ordinary formed by two diagonal lines, drawn from the dexter-chief to the sinister-base : and contains the fifth part of the field in breadth, if uncharged ; but if charged, then the third. Its diminutives are, the bendlet, which is the half of a bend ; the cost or cotice, when two of them accompany a bend, which is the fourth part of a bend ; and the ribband, the moiety of a cost, or the eighth part of the field.

There is also the bend-sinister, which is of the same breadth as the bend, but drawn the contrary way : this is subdivided into a scrape, which is the half of the bend, and into a baton, which is the fourth part of the bend, but does not extend itself to the extremities of the field, there being part of it seen at both ends. See the examples, fig. 7.

Ex. 1. " Argent, a Bend wavy Sable ;" borne by the right honourable John Wallop, earl of Portsmouth, &c. This noble earl is descended from the Wallops of Hampshire, a Saxon family, who were possessed of lands to a considerable value in the county at the time of the conquest. Plate CCLVI.

2. " Checky Or, and Azure, a Bend Ermine ;" borne by the right honourable John Ward, Viscount Dudley and Ward, &c. The ancestors of this noble lord were anciently of the county of Norfolk, of which was Simon Ward, who had large possessions in the reign of Edward I. and was in France and Scotland in the reigns of King Edward II. and III.

3. " Azure, a Bend engrailed Argent, between two Cotices Or ;" borne by the right honourable Matthew Fortescue, Lord Fortescue, as also by the right

Of the Bend.

right honourable Hugh Fortescue-Aland, Baron Fortescue, in the kingdom of Ireland, this last nobleman bearing a crescent in his arms for difference. The family of Fortescue is descended from Sir Richard le Forte, a person of extraordinary strength and courage, who accompanied William duke of Normany in his invasion of England; and bearing a strong shield before the duke, at the battle of Hastings, had three horses killed under him, and from that signal event the name and motto of the family were assumed; for the Latin word *scutum*, or the old French word *escue* "a shield," being added to *forte* "strong," compose their name; and the motto is, *Forte scutum salus ducum*.

4. "Sable, a Bend Argent between two Cotices indented Or;" borne by the name of *French*.

5. "Paly of six Or and Sable, a Bend counterchanged;" borne by the right honourable Frederick Calvert, Baron Baltimore. The original of this family is from an ancient and noble house of that surname in the earldom of Flanders, whereof Sir George Calvert, knight, among other honourable employments, was secretary of state to King James I. by whom he was created a baron, Feb. 20. 1624, and from whom he had a grant to him, and his heirs, of the province of Maryland and Avalon in America.

6. "Party per Bend crenelle Argent and Gules;" borne by the right honourable Edmund Boyle, earl of Cork and Orrery, &c. in the kingdom of Ireland. This noble lord is said to be descended from Sir Philip Boyle, a knight of Arragon, who, in the reign of King Henry VI. tilted at a tournament with Sir Joseph Astley, knight of the Garter.

7. "Argent, three Bendlets enhansed Gules:" as the English express it, but the phrase enhansed is used by no other nation. The proper blazon of this arms is, Parted per bend, 1st bendy of six gules, and argent; 2d of the last. Borne by the right honourable William Byron, Lord Byron. From Doomsday-book it appears, that this family was possessed of numerous manors and lands in the reign of the Conqueror; and that Sir John Byron, one of his lordship's ancestors, attended King Edward III. in his wars in France.

8. "Ermine, a Bend voided Gules;" borne by the name of *Ireton*.

9. "Argent three Bendlets wavy Azure;" borne by the name of *Wilbraham*.

10. "Bendy of six pieces Argent and Azure." Observe, that when the shield is filled with an equal number of bendlets of metal and colour, it is called *bendy*; but if the number of them is unequal, they are to be blazoned by the name *bendlets*, and their number specified.

11. "Party per Bend Azure and Argent, two Bendlets engrailed counterchanged;" borne by the name of *Frenes*.

12. "Quarterly, Or and Gules, a Bend over-all Vair;" borne by his grace Lionel Cranfield Sackville, duke of Dorset and earl of Middlesex, &c. The ancestors of this family were lords of the town and seigniory of Sackville in Normandy, and came over with the Conqueror when he invaded England in 1066.

13. "Gules on a Bend Argent, three Trefoils slipped proper;" borne by the right honourable George William Hervey, earl of Bristol, &c. This noble lord derives his pedigree from Robert Fitz-Hervey, a younger son of Hervey duke of Orleans, who came over from France with William the Conqueror.

Of the Fess and Bar.

14. "Argent, on a bend Gules cotised Sable; three pairs of Wings conjoined of the first;" borne by the right honourable Richard Wingfield, Viscount Powerscourt, in the kingdom of Ireland. This noble lord is denominated from the manor of Wingfield in Suffolk, where they had a seat before the Norman conquest, called *Wingfield-castle*.

15. "Gules, on a Bend contre Ermine cotised Or, three Boars Heads couped Argent;" borne by the right honourable George Edgcumbe, Lord Edgcumbe, &c. The ancestors of this noble lord received their name from the manor of Edgcumbe in Devonshire. One of this lord's ancestors was Sir Richard Edgcumbe, who came over to England with the earl of Richmond, having a great share in the victory he obtained over King Richard III. at Bosworth, by which the earl made his way to the throne of England.

16. "Argent, a Bend-sinister Gules."

17. "Or, a Bendlet Gules."

18. "Argent, a Ribband Gules."—The name of this bearing corresponds well with its form, being both long and narrow, which is the shape of a ribband.

19. "Azure, a Scrape Or."—This bearing, as Guillim observes, is that kind of ornament called now-a-days a *Scarf*, which is used by officers on duty, and usually worn after the same manner.

20. This contains three Batons. The first is compony ermine and azure; set over the royal arms, for his grace William Fitzroy duke of Cleveland. The second is compony argent and azure; set over the royal arms, for his grace Augustus Henry Fitzroy, duke of Grafton. The third is gules, charged with three roses argent, seeded and barbed proper; set over the royal arms, for his grace George Beauclerk, duke of St Albans. The grandfathers of these noble dukes being natural sons of King Charles II. is what entitles them to the royal arms.

Art. 4. Of the Fess and Bar.

The Fess is an ordinary which is produced by two parallel lines, drawn horizontally across the centre of the field, and contains in breadth the third part thereof. Some English writers say it has no diminutive, for a bar is a distinct ordinary of itself.

The Bar, according to their definition, is formed of two lines, and contains but the fifth part of the field: which is not the only thing wherein it differs from the fess; for there may be more than one in an escutcheon, placed in different parts thereof, whereas the fess is limited to the centre-point; but in this the French differ from them. The bar has two diminutives; the barulet, which contains the half of the bar; and the closet, which is the half of the barulet. When the shield contains a number of bars of metal and colour alternate, of even number, that is called *barry* of so many pieces, expressing their number. See the examples, fig. 8. Plate CCLVI.

N° 1. is "Argent, a Fess indented Sable;" borne by the right honourable John West, Earl Delaware, &c. This noble family is descended from the Wests, a great family in the west of England; but in the reign of Edward II. they appear to have been seised of manors

Of the Fess and Bar.

nors and lands in the county of Warwick. Sir Thomas de West, knight, one of his lordship's ancestors, being at the battle of Cressy, and there taking John the French king prisoner, had granted him, for that remarkable action, an augmentation to his atchievement, viz. a Crampette Or, distinguished by the chape of a sword in the middle; the chape being given him by the said king, as an acknowledgment of his becoming his prisoner: his cognizance was a rose parted per pale, argent, and gules; which two badges are still borne in the atchievement of the present Lord Delaware.

2. "Argent, a Fess wreathed Azure and Gules;" borne by the right honourable John Carmichael, earl of Hyndford. Of this ancient family, which is said to assume their surname from the lands of Carmichael, in the county of Lanark, in Scotland, where they still have their chief seat, was Sir John Carmichael, who accompanied Archibald, earl of Douglas, to the assistance of Charles VI. of France, against the English; and signalizing his valour at the battle of Baughey in April 1421, and breaking his spear when the French and Scots got the victory, had thereupon added to his paternal coat, a dexter arm holding a broken spear, which is now the crest of the family.

3. "Party per Fess Or and Argent, a Fess nebule Gules;" borne by the name of *Anteshed*.

4. "Party per Fess indented Or and Azure;" borne by the name of *Saunders*.

5. "Checky Or and Azure on a Fess Gules, a Crescent Argent for difference;" borne by the right honourable Hugh Clifford, Lord Clifford, of Chudley. This noble lord is descended from Walter de Clifford, of Clifford castle, in the county of Hereford, who came over into England with the Conqueror; of which family was fair Rosamond, mistress to King Henry II.

6. "Argent, on a Fess Azure, three Lozenges Or;" borne by the right honourable Basil Fielding, earl of Denbigh and Desmond, &c. This noble earl is descended from the earls of Hapsburg, in Germany. Geoffroy earl of Hapsburg, being oppressed by Rodolph emperor of Germany, came over into England, and one his sons served King Henry III. in his wars, whose ancestors laying claim to the territories of Lauffenburg and Rhin-Fielding, in Germany, he took the name of *Fielding*.

7. "Or, on a Fess Gules, three Fleurs-de-lis of the first;" borne by the name of *Lennard*. This is in the first and fourth quarters of the right honourable Thomas Barret Lennard Lord Dacre's arms.

8. "Ermine, on a Fess Gules, a Lion passant Or;" borne by the right honourable John Proby, Baron Carysfort, &c. in the kingdom of Ireland.

9. "Sable, a Fess Ermine, between three Crescents Or;" borne by the right honourable George William Coventry, earl of Coventry, &c. This noble earl is descended from John Coventry, a native of the city of Coventry, and afterwards mercer and lord mayor of London, in the reign of Henry V.: from whom descended Thomas Coventry, one of the justices of the court of common-pleas, in the reign of Queen Elizabeth; whose son Thomas was recorder of London, and afterwards lord keeper of the great seal in the reign of King Charles I.

10. "Sable, a Fess checky, Or and Azure, between three Besants;" borne by the right honourable Ridgeway Pitt, earl and baron of Londonderry, &c. Of this noble family, which were anciently of Bandfort, in the couuty of Dorset, was Thomas Pitt, Esq. who, in the reign of Queen Anne, was made governor of Fort St George in the East Indies, where he resided many years, and purchased a diamond, which he sold to the king of France for 125,000l. sterling, weighing 136 carats, and commonly known at this day by the name of *Pitt's diamond*.

11. "Or, on a Fess Sable, between three Muscovy Ducks proper, a Rose of the Field;" borne by the right honourable John Bateman, Viscount Bateman, &c. Of this noble family, which was anciently seated at Halesbrook, near St Omers in Flanders, was Giles Bateman, Esq. whose son was a merchant of London, and was father to Sir James Bateman, knight, who, in 1712, was chosen member of parliament for Ilchester in the county of Somerset, and re-chosen in 1713.

12. "Sable, on a Fess Argent, between three Leopards passant guardant Or, three Escalops Gules;" borne by the right honourable Wills Hill, earl of Hillsborough, &c. Of this family, which, in the reign of Queen Elizabeth, were of note in the county of Downe, was Sir Moses Hill, who, during O'Neile's rebellion, was one of those gentlemen who associated under the earl of Essex to suppress it; and afterwards served under Arthur Lord Chichester, lord deputy, and by King James I. was appointed provost-marshal of the whole province of Ulster in Ireland.

13. "Gules, two Bars Or;" borne by the right honourable Simon Harcourt, earl of Harcourt, &c. This noble earl is descended from the Harcourts of Normandy, who took their name from a place called *Harcourt*, in that province, where the family usually resided. Gervaise, count de Harcourt, with his two sons Jeffrey and Arnold, came over with the Conqueror, when he invaded England in 1066.

14. "Ermine, two Bars Gules;" borne by the right honourable Thomas Nugent, earl of Westmeath, Baron Delvin.

15. "Argent, two Bars indented Sable;" borne by the right honourable Godart Ginkle, earl of Athlone. Godart, who was the first earl, was descended of a very ancient family in the united provinces of Holland, where he was baron de Reede and Ginkle, &c. In 1691, he was a lieutenant-general of King William's forces in Ireland; where, in June the same year, he took Ballymore for the English; and, in July following, the Irish town of Athlone, which last exploit is one of the greatest recorded in history.

16. "Argent, three Bars gemels Gules;" borne by the right honourable Richard Barry, earl of Barrymore, &c. This noble family, who have been renowned for their loyalty and valour, are said to derive their surname from the island of Barry, in the county of Glamorgan, in Wales; and from their riches and estates have been called by the people *Barrymore*, or the Great Barry.

17. "Or, a Fess-couped Gules, between two Lions passant Sable;" borne by the right honourable Samuel Masham, Lord Masham, &c. This noble lord is descended from Sir John Masham, who flourished in the reign of King Henry VI. and was buried at Thorneham, in the county of Suffolk, in 1455.

18.

Of the Cheveron.

18. "Argent, a Lion rampant guardant Gules, debruifed by a Fefs Azure, between three Etoiles iffuing out of as many Crefcents of the fecond;" borne by the right honourable Robert Dillon, earl of Rofcommon, &c. in the kingdom of Ireland. This noble family is derived from Logan, furnamed *Dilune* or *Delion*, which fignifies brave and valiant, to whom the duke of Aquitaine gave his daughter in marriage, in whofe right, after her father's death, he became prince and fovereign of Aquitaine, which continued in his pofterity till Henry II. married Alionora, daughter and heir to William V. duke of Aquitaine, and about 1172 obtained that principality by fuperior force; and, to prevent any difturbance, brought Sir Henry Delion or Dillon, and his brother Thomas, then infants, to England, their father being flain.

19. "Or, two Bars Azure, a Chief quarterly of the the fecond and Gules, the 1ft and 4th charged each with two Fleurs-de-lis of France; the 2d and 3d with a Lion of England;" borne by his grace John Manners, duke of Rutland, marquis of Granby, &c. This chief was anciently Gules; and the charge thereon is an honorary augmentation, fhowing his grace's defcent from the blood-royal of King Edward IV.

20. "Barry of ten pieces Argent and Azure, over all fix Efcutcheons; 3, 2, 1, Sable, each charged with a Lion rampant of the firft, armed, and langued Gules, a Crefcent for difference;" borne by the right honourable James Cecil, earl of Salifbury, &c. This noble earl is defcended from the famous *William Cecil*, Lord Burleigh, ftatefman in the reigns of Edward VI. and Elizabeth. This great man left two fons, Thomas and Robert, who were both made earls in one day, May 4. 1603. Robert, the younger fon, anceftor of the prefent noble lord, was created earl of Salifbury in the morning; and Thomas, the eldeft, earl of Exeter in the afternoon.

Art. 5. Of the Cheveron.

The Cheveron, which reprefents two rafters of a houfe well joined together, or a pair of compaffes half open, takes up the fifth part of the field with the Englifh, but the French give it the third. Its diminutives are, The cheveronel, which contains the half of a cheveron; and the couple clofe, which is the half of a cheveronel, that is, its breadth is but the fourth part of a cheveron. Leigh obferves, that this laft diminutive is never borne but in pairs, or with a cheveron between two of them. The French have but one diminution of this ordinary called *Etaye*, containing the third part of its breadth.

Plate CLVI.

Examples of cheverons are given in fig. 9. viz.

1. "Argent, a Cheveron Gules between three Torteaux;" borne by the right honourable Bennet Sherrard, earl of Harborough, &c. This noble earl is lineally defcended from Scherard, who was poffeffed of manors and lands to a great value in the counties of Chefhire and Lancafhire in the reign of William the Conqueror. Geoffroy, another of this earl's anceftors, was three times fheriff of Rutlandfhire, in the reigns of King Edward IV. and King Richard III.

2. "Sable, a Cheveron between three Etoiles Argent;" borne by the right hon. Marmaduke Langdale, Lord Langdale. This noble lord is defcended from the Langdales of Yorkfhire, who refided at the town of Langdale, from whence they took their name, in the reign of King John; but his anceftor, who makes the greateft figure in hiftory, is Sir Marmaduke Langdale, who raifed forces in the north of England in defence of King Charles I.; was victorious in numberlefs battles and fieges; and when his majefty, by the united forces of England and Scotland, was at length overpowered, he attended King Charles II. in his exile, and returned to England with his majefty at the reftoration.

3. "Sable, a Cheveron between three Leopards Heads Or;" borne by the right hon. William Wentworth, earl of Strafford, &c. All genealogifts agree, that the name of *Wentworth* is of Saxon original, and taken from the manor of Wentworth in Yorkfhire, where, in the reign of William the Conqueror, lived Reginald de Wenteworde, as it is fpelt in Doomfday-book.

4. "Argent, a Cheveron between three Griffons paffant Sable, a Crefcent for difference;" borne by the right hon. Heneage Finch, earl of Ailesford, &c. This family is defcended from Herbert Fitz-Herbert, earl of Pembroke, and chamberlain to King Henry I. They took the name of *Finch* in the reign of King Edward I. One of the anceftors of this family was the right hon. Heneage Finch, earl of Nottingham, who was conftituted lord high-chancellor of England in 1675; and lord high-fteward on the trials of Philip earl of Pembroke, and William vifcount Stafford, in 1680.

5. "Azure, a Cheveron Ermine, between three Efcalops Argent;" borne by the right hon. George Townfhend, Vifcount Townfhend, &c. This family is of Norman extraction, and came into England about the time of the conqueft. Charles, lord vifcount Townfhend, grandfather of the prefent vifcount, was appointed principal fecretary of ftate in the reign of King George I. in 1720, and continued fo to the end of his majefty's reign; when, upon refigning the feals, they were returned to him again by his late majefty King George II. who continued him in that honourable office to the year 1730.

6. "Azure, a Cheveron between three Mullets Or;" borne by the right honourable John Chetwind vifcount Chetwind, &c. of the kingdom of Ireland. Of this family, which hath been of great antiquity in the county of Salop, taking their furname from Chetwynd in that county, was Adam de Chetwynd, who married Agnes daughter of John Lord Lovel, baron of Dockinges, and lord of Minfter Lovel in Oxfordfhire; and by her had iffue Sir John de Chetwynd, who, in the 37th of Henry III. had a charter of free-warren, through all his demefne in the counties of Salop, Stafford, and Warwick.

7. "Argent, a Cheveron Gules, between three fquare Buckles Sable;" borne by the right honourable Matthew Ducie-Morton, Lord Ducie, &c. This noble lord is defcended from the Ducies in Normandy. After they came into England, King Edward I. conferred on them the lordfhip of Morton in Staffordfhire, and feveral other lordfhips and manors, which the family enjoyed for many years. Sir Robert Ducie, one of his lordfhip's anceftors, was lord mayor of London in the reign of King Charles I. and though he lent his majefty 80,000l. which was loft by the king's being driven

Of the Cheveron.

driven out of London, he died, however, worth 400,000l.

8. "Argent, a Cheveron Checky Gules, and of the Field, between three Bugle-horns ſtrung Sable, garniſhed of the ſecond;" borne by the right honourable Lord Hugh Semple, Lord Semple. The principal family of this name was Semple of Eliotſton in Renfrewſhire, where they had large poſſeſſions and offices, as ſtewards and bailiffs under the family of Stewart, proprietors of that county before they came to the crown. The firſt Lord Semple was Sir Robert, who, being much in favour with King James IV. was by him created Lord Semple in 1489.

9. "Argent, a Cheveron engrailed between three Lions paſſant Sable;" borne by the right honourable and the reverend Philip Smithe, Viſcount Strangford. One of this lord's anceſtors was John Smithe, Eſq; who acquired a conſiderable eſtate whilſt he was farmer of the cuſtoms in the reign of Henry VIII. He left two ſons, John and Sir Thomas; which laſt was ſent ambaſſador by King James I. to the empreſs of Ruſſia.

10. "Quarterly Argent and Azure, a Cheveron engrailed counter-changed;" borne by the name of *Chamber*.

11. "Party per Cheveron engrailed Gules and Argent, three Talbots Heads eraſed counter-changed;" borne by the right honourable Anthony Duncombe, Lord Feverſham, &c. His lordſhip is deſcended from the Duncombes of Barley-end in Buckinghamſhire. Sir Charles Duncombe, uncle to the preſent lord, was lord mayor of London in 1709; and this nobleman was created Lord Feverſham and baron of Dowton in Wiltſhire, June 23. 1744.

12. "Paly of ſix, Argent and Gules, on a Cheveron Azure, three Croſs-croſlets Or;" borne by the name of *Carpenter*, Baron Carpenter, of Killaghy in Ireland. This ancient and noble family are of great antiquity in the county of Hereford, and have been lords of the manor of the Home in the pariſh of Delwyn, near Weobley, for above 300 years. George, the firſt Lord Carpenter, was ſo created May 4. 1719.

13. "Azure, on a Cheveron Or, between three Beſants, a Bay Leaf Proper;" borne by the right honourable James Hope, earl of Hopeton, &c. This noble family is deſcended from Henry Hope, a native of Holland, who, about two centuries ago, came over and ſettled in Scotland. Charles Hope, Eſq. grandfather of the preſent earl, was created an earl by Queen Anne, April 15. 1703.

14. "Vert, on a Cheveron between three Unicorns Heads eraſed Argent, horned and maned Or, three Mullets Sable;" borne by the name of *Ker*, being the 1ſt and 4th quarters in the arms of his grace John Ker, duke of Roxburgh, &c. This ancient family is ſaid to come from Normandy. John Ker, marquis of Beaumont and Ceſford, the firſt duke of Roxburgh, was ſo created April 27. 1707.

15. "Azure, on a Cheveron Or, between three Bears Heads couped Argent, muzzled Gules, a Roebuck's Head eraſed, between two Hands holding Daggers all proper;" borne by the right honourable Donald Mackay, Lord Reay. This family is ſaid to derive their deſcent from Alexander, a younger ſon of Ochonacker, who, about the end of the twelfth century, came from Ireland; and the fourth in deſcent from him was Donald of Strathnavern, whoſe ſon was named *Y More*; and from him began the ſurname of *Mac Y*, *Mackie*, or *Mackay*. Donald, the firſt lord of this family, was created baronet in 1625, and on June 20. 1628, was created Baron Reay of the county of Caithneſs, by Charles I.

16. "Ermine, on a Cheveron Azure, three Foxes Heads eraſed Or, and in a Canton of the ſecond a Fleur-de-lis of the third;" borne by the right honourable Stephen, earl of Ilcheſter, &c. Of the family of Fox there have been many perſons of note living in the counties of Dorſet, Somerſet, Wilts, and Hants, particularly Richard Fox, biſhop of Wincheſter. His lordſhip was created Lord Ilcheſter and Baron Strangeways, May 11. 1741, 14 Geo. II. and earl of Ilcheſter in June 1756.

17. "Or, two Cheveronels Gules;" borne by the right honourable John Monſon, Lord Monſon. This noble lord is deſcended from John Monſon, who flouriſhed in the reign of King Edward III. from whom deſcended another John, who attended King Henry V. in his wars in France. Sir John Monſon, Bart. father of the preſent lord, was created Lord Monſon, May 28. 1728.

18. "Or, on a Feſs, between two Cheveronels Sable, three Croſs-croſlets of the firſt;" borne by the right honourable George Walpole, earl of Orford, &c. This family took their name from Walpole in Norfolk, where they reſided before the conqueſt. Sir Robert Walpole was, in King George II.'s reign, elected knight of the garter in 1726, and created earl of Orford, February 9. 1741-2.

19. "Azure, three Cheveronels interlaced Or, and a Chief of the laſt;" borne by the name of *Fitz-Hugh*.

20. "Argent, three Cheveronels Gules, in Chief a Label Azure;" borne by the right honourable William Wildman Barrington, Viſcount Barrington, &c. This family is of Norman extraction; in which duchy, whilſt it continued annexed to the Engliſh crown, there were to be ſeen the remains of a caſtle, bearing the name of *Chute*, or *Shute*, and formerly in the family, with other monuments in ſeveral towns of that duchy. John Shute, the late Viſcount Barrington, was in 1708 made a commiſſioner of the cuſtoms, and ſucceeded to the eſtates of Francis Barrington, Eſq.; and of John Wildman of the county of Berks, who made him their heir; and in purſuance of the will of the former, he took the name and arms of *Barrington*. On June 11. 1720, he was created Viſcount Barrington.

Of the Croſs.

Art. 6. Of the Cross.

The *Croſs* is an ordinary formed by the meeting of two perpendicular with two horizontal lines in the feſs-point, where they make four right angles; the lines are not drawn throughout, but diſcontinued the breadth of the ordinary, which takes up only the fifth part of the field when not charged; but if charged, then the third. It is borne as well engrailed, indented, &c. as plain.

There is ſo great a variety of croſſes uſed in heraldry, that it would be a very difficult taſk to treat of them all. Guillim has mentioned 39 different ſorts; De la Columbiere, 72; Leigh, 46; and Upton declares he

Of the Crofs.

Plate. CCLVI.

he dares not afcertain all the various croffes borne in arms, for that they are almoft innumerable; therefore, as all their forms cannot be expected here, we will only take notice of fuch as are moft commonly feen at prefent in coats-of-arms. See Fig. 10.

The firft is "Quarterly, Ermine and Azure, a Crofs Or;" borne by his grace Thomas Ofborne duke of Leeds, &c. This noble duke is defcended from the honourable family of the Ofbornes of Afhford, in the county of Kent; Sir Thomas Ofborne, the grandfather to the prefent duke, was advanced to the peerage by King Charles II.

2. "Gules, a Crofs engrailed Argent, a Lozenge in the dexter-chief of the fecond;" borne by the right honourable Edward Leigh, Lord Leigh. This family took their furname from the town of High Leigh in Chefhire, where they refided before the Norman conqueft. Sir Thomas Leigh, the firft lord of this family, was created Baron Leigh of Stonely, by King Charles I. on July 1. 1643.

3. "Gules, a Crofs Argent fretty Azure:" borne by the right honourable Nicholas Taaffe, Vifcount Taaffe, of Corran, &c. in Ireland. Of this noble and ancient family was Richard Taaffe, who lived in 1282; as in 1306 did John Taaffe, who was archbifhop of Armagh; and, in 1479, the order of the Garter being eftablifhed in Ireland, Sir Nicholas Taaffe was one of the firft members; and John, his fon and heir, was created a baron and vifcount by Charles I. Auguft 1. 1628.

4. "Sable, a Crofs raguly Or;" borne by the name of *Stoway*.

5. "Argent, on a Crofs Sable, a Leopard's face Or;" borne by his grace Henry Brydges duke of Chandos, &c. The anceftors of this noble family took their name from the city of Bruges in Flanders; and one of them came over with William the Conqueror, and had a confiderable fhare in the victory obtained near Haftings in Suffex, 1066. James, the father of the prefent duke, was created Vifcount Wilton and earl of Caernarvon, October 19. 1714; and marquis of Caernarvon and duke of Chandos, ——— 30. 1719.

6. "Or, on a Crofs Sable, a patriarchal Crofs of the Field;" borne by the right honourable Thomas Vefey, baron of Knapton in the kingdom of Ireland. The truly noble family of Vefcey or Vefey, derives its origin from Charles the Great, king of France, and emperor of the weft, who died at Aix-la-Chapelle in Germany, January 28. 814. His lordfhip's father was created a peer April 10. 1750.

7. "Argent, on a Crofs Gules, five Efcalops Or;" borne by the right honourable William Villiers earl of Jerfey, &c. This noble earl is defcended from the family of Villiers in Normandy, fome of whom came over to England with the Conqueror; feveral manors and lands in England being foon after granted to Pagan de Villiers, one of this earl's anceftors. The firft peer of this family was created a baron and vifcount, March 20. 1690.

8. "Sable, on a Crofs within a Bordure engrailed Or, five Pellets;" borne by the right honourable Francis Greville, earl of Brooke and Warwick, &c. The anceftors of this noble family are of Norman extraction, and came over with William the Conqueror, who conferred manors and lands on them in England, of a confiderable value; and at length they obtained the government of the caftle of Warwick, the prefent feat of the family. Sir Fulke, the firft peer of this family, was created Baron Brooke by King James I. January 9. 1620.

9. "Argent, a Crofs botonny Sable," borne by the name of *Winwood*.

10. "Or, a Crofs-croflet Gules," borne by the name of *Taddington*.

11. "Azure, a Crofs potent fitchy Or." This enfign is faid to have been borne by Ethelred king of the Weft Saxons; and croffes of this fort are frequently met with in coats of arms.

12. "Party per pale, Gules and Argent; a Crofs potent quadrate in the Centre, between four Croffes pattee counter-changed;" the arms of the epifcopal fee of Litchfield and Coventry. This fee was originally fixed at Litchfield; from thence removed to Chefter, and from both to Coventry. It contains the whole county of Stafford, except two parifhes; all Derbyfhire; the better part of Warwickfhire, and near half Shropfhire; divided into the four archdeaconries of Coventry, Stafford, Derby, and Salop. The parifhes are 557 in number; but, including chapels, they amount to 643.

13. "Azure, a Crofs moline Argent;" borne by his grace Cavendifh Bentinck, duke of Portland, &c. This noble duke is defcended from a very ancient and diftinguifhed family in the United Provinces of Holland, of which was William Bentinck, Efq. who in his youth was page of honour to William prince of Orange, afterwards William III. king of Great Britain, and, on the acceffion of William and his confort, was made groom of the ftole, privy-purfe to his majefty, lieutenant-general of his majefty's army, &c. and alfo created baron of Cirencefter, Vifcount Woodftock, and earl of Portland, April 19. 1689.

14. "Argent, a Crofs patonce Sable;" borne by the name of *Rice*.

15. "Sable, a Crofs pattee Argent;" borne by the name of *Maplefden*.

16. "Azure, a Crofs flowery Or; borne by the name of *Cheney*.—This is faid to have alfo been the arms of Edwin, the firft Chriftian king of Northumberland.

17. "Argent, fix Crofs-croflets fitchy 3, 2, 1, Sable, on a Chief Azure, two Mullets pierced Or," borne by his grace Henry Clinton, duke of Newcaftle, &c. This noble family is defcended from Jeffrey de Clinton, lord chamberlain and treafurer to King Henry I. grandfon to William de Tankerville, chamberlain of Normandy; from whom defcended William de Clinton, chief juftice of Chefter, governor of Dover caftle, lord warden of the king's forefts fouth of Trent. Edward Lord Clinton, another of this noble earl's anceftors, was conftituted lord high-admiral of England for life, in the reign of Queen Elizabeth, who created him earl of Lincoln, May 4. 1572.

18. "Gules, a Cheveron between ten Croffes pattee, fix above and four below, Argent;" borne by the right honourable Frederick Auguftus Berkeley, earl of Berkeley, &c. This noble family is defcended from Robert Fitz-Harding, who obtained a grant of Berkeley-

Of the Saltier.

ley-castle in Gloucestershire, which the family still inherits, and from whence they obtained the surname of *Berkeley*, from Henry duke of Normandy, afterwards king of England; the said Robert Fitz-Harding was descended from the royal line of the kings of Denmark.

19. "Azure, three mullets Or, accompanied with seven Cross-crosslets fitchy Argent, three in Chief, one in Fess, two in Flanks, and the last in Base;" borne by the right honourable James Somerville, Lord Somerville. The first of this name on record is Sir Walter de Somerville, lord of Wichmore, in the county of Stafford, who came to England with William the Conqueror.

20. "Gules, three Crosses recercelée, voided Or, a Chief vairy ermine and contre ermine;" borne by the right honourable John Peyto Verney, Baron Willoughby de Broke. This noble lord is descended from William de Vernai, who flourished in the reign of King Henry I. 1119.

Art. 7. Of the Saltier.

The Saltier, which is formed by the bend and bend-sinister crossing each other in right angles, as the intersecting of the pale and fess forms the cross, contains the fifth part of the field; but if charged, then the third. In Scotland, this ordinary is frequently called a *St Andrew's Cross*. It may, like the others, be borne engrailed, wavy, &c. as also between charges or charged with any thing. See examples, fig. 11.

Plate CCLVII.

N° 1. is "Argent, a Saltier Gules;" borne by his grace James Fitz-Gerald, duke of Leinster, &c. This noble lord is descended from Otho, or Other, a rich and powerful lord in the time of King Alfred, descended from the dukes of Tuscany; who passing from Florence into Normandy, and thence into England, there the family flourished, until Richard Strongbow, earl of Pembroke, their kinsman, engaged them to partake in his expedition to Ireland, in which Maurice Fitz-Gerald embarked, and was one of the principal conquerors of that kingdom, for which he was rewarded with a great estate in lands in the province of Leinster, and particularly the barony of Offaley, and the castle of Wicklow; and died, covered with honours, in the year 1177, 24 Henry II.

2. "Gules, a Saltier Argent, between twelve Cross-crosslets Or;" borne by the right hon. Other-Lewis Windsor Hickman, earl of Plymouth, &c. This noble earl is descended from Robert Fitz-Hicman, lord of the manor of Bloxham, Oxfordshire, in the 56 Hen. III. 1272; and he is maternally descended from the noble family of the Windsors, who were barons of the realm at the time of the conquest.

3. "Vert, a Saltier wavy Ermine;" borne by the name of *Wakeman* of Beckford, in Gloucestershire.

4. "Ermine, a Saltier counter-company Or and Gules;" borne by the name of *Ulmston*.

5. "Argent, a Saltier Azure with a Bezant in the centre; borne by the right hon. Philip Yorke, earl of Hardwicke, &c. He was in October 1733 constituted lord chief-justice of the king's bench, and November 23. in the same year, created Baron Hardwicke of Hardwicke.

6. "Argent on a Saltier Gules an Escalop Or;" the arms of the bishoprick of Rochester.—This diocese, the least in England, comprehends only a small part of Kent, in which there are 150 churches and chapels; and the two parishes of Iselham in Cambridgeshire, and Frekenham in Suffolk. It has only one archdeacon, that of Rochester. For many years it was in the immediate patronage of the archbishop of Canterbury.

Of the Saltier.

7. "Party per Saltiere, Azure and Argent, on a Saltier Gules, a Crescent of the second for difference;" quartered by the right hon. William Hall Gage, Viscount Gage, of Castle-Island in Ireland. This noble family is of Norman extraction, and derives descent from de Gaga or Gage, who attended William I. in his expedition to England; and, after the conquest thereof, was rewarded with large grants of lands in the forest of Dean, and county of Gloucester, near which forest he fixed his residence, by building a seat at Clerenwell, in the same place where the house of Gage now stands: he also built a great house in the town of Cirencester, at which place he died, and was buried in the abbey there. Sir Thomas Gage, the eighth baronet, was created baron of Castle-Bar, and Viscount Gage, 1721.

8. "Gules, on a Saltier Argent, a Rose of the first barbed and seeded proper;" borne by the right hon. George Neville, Lord Abergavenny, premier baron of England.

9. "Or, on a Saltier Azure, nine Lozenges of the first;" the paternal arms of the right hon. John Dalrymple, earl of Stair, &c. Of this family, which took their surname from the barony of Dalrymple, lying on the river Dun in Ayrshire, Scotland, was Adam de Dalrymple, who lived in the reign of Alexander III.

10. "Argent, on a Saltier engrailed Sable, nine Annulets Or;" borne by the name of *Leak*.

11. "Gules, a Saltier between four Crescents Or;" borne as the second and third quarters in the coat-of-arms of the right honourable Charles Kinnaird, Lord Kinnaird. George Kinnaird, Esq. one of the present lord's ancestors, being of great service to King Charles II. during the usurpation of Oliver Cromwell, he was by that prince, at his restoration, made one of the privy-council; and December 28. 1682, created a baron.

12. "Argent, a Saltier engrailed between four Roses Gules," for Lennox; and borne as first and fourth quarters in the coat-of-arms of the right hon. Francis Napier, Lord Napier. This family is said to be descended from the ancient thanes or stewards of Lennox in Scotland, but took the surname of Napier from the following event. King David II. in his wars with the English, about the year 1344, convocating his subjects to battle, the earl of Lennox sent his second son Donald, with such forces as his duty obliged him; and, coming to an engagement, where the Scots gave ground, this Donald, taking his father's standard from the bearer, and valiantly charging the enemy with the Lennox men, the fortune of the battle changed; and they obtained the victory: whereupon every one advancing, and reporting their acts, as the custom was, the king declared they had all behaved valiantly, but that there was one among them who had *na pier*, that is, no equal; upon which the said Donald took the name

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name of Napier, and had, in reward for his good services, the lands of Gosfield, and other estates in the county of Fife.

13. "Gules, a Saltier Or, surmounted of another Vert," for the name of *Andrews;* and borne by Sir William Andrews, bart. of Denton in Northamptonshire, who is descended from Sir Robert Andrews of Normandy, knight, who came into England with William the Conqueror. Sir William Andrews, the first baronet of this family, was created December 11. 1641.

14. "Azure, a Saltier quarterly quartered Or and Argent." The arms of the episcopal see of Bath and Wells.—The diocese of Bath and Wells contains all Somersetshire, except a few churches in Bristol. And in it there are three archdeaconries, viz. those of Wells, Bath, and Taunton. The number of the parishes is 388, though, according to some, the total number of the churches and chapels amounts to 503.

15. "Party per Saltier Argent and Gules, a Saltier counter-changed."

16. "Party per Pale indented Argent and Sable, a Saltier counter-changed;" borne by the name of *Scote.*

17. "Argent, three Saltiers couped and engrailed Sable;" borne by the name of *Benton.*

18. "Argent, a Saltier Gules, and a Chief Ermine;" borne by the right hon. Francis Thomas Fitz-Maurice, earl of Kerry, &c. This very ancient and noble family is a branch of the family of Kildare, who are originally descended from the great duke of Tuscany, and of which was Otho, a noble baron of Italy, whose son Walter, attending the Norman conqueror into England, was made constable of the castle of Windsor. Raymond, one of the present earl's ancestors, had a principal hand in the reduction of Ireland to the subjection of Henry II. and Dermoid MacCarty, king of Cork, sought his aid against his son Cormac O'Lehanagh, which he undertook, and delivered the king from his rebellious son; for which that prince rewarded him with a large tract of land in the county of Kerry, where he settled his son Maurice, who gave his name to the county, which he called *Clan-Maurice,* and is enjoyed by the present earl of Kerry, who is Viscount Clan-Maurice. Thomas the first earl, and father of the last, was the 21st Lord Kerry, who was created earl January 17. 1722.

19. "Sable, a Saltier Argent, on a Chief Azure, three Fleurs-de-lis Or;" borne by the right hon. John Fitz-Patrick, earl of Upper Offory, and baron of Gowran in Ireland. This most ancient and princely family is descended from Heremon, the first monarch of the Milesian race in Ireland; and after they had assumed the surname of Fitz-Patrick, they were for many ages kings of Offory, in the province of Leinster. John, the first earl of this family, succeeded his father Richard as Lord Gowran, June 9. 1727, was created earl October 5. 1751, and died 1758.

20. "Party per Pale Argent and Gules, three Saltiers counter-changed;" borne by the name of *Lane.* These arms are also borne, without the least alteration, by the name of *Kingsman;* for which similitude we can no otherwise account, than by supposing there has been some mistake made through many transcriptions.

Sub-Ordinaries.

Sect. II. *Of Sub-Ordinaries.*

Besides the honourable ordinaries and the diminutions already mentioned, there are other heraldric figures, called *sub-ordinaries,* or *ordinaries* only, which, by reason of their ancient use in arms, are of worthy bearing, viz. The Gyron, Franc-quarter, Canton, Pairle, Fret, Pile, Orle, Inescutcheon, Tressure, Annulet, Flanches, Flasques, Voiders, Billet, Lozenge, Gutts, Fusil, Rustre, Mascle, Papillone, and Diaper. See Plate CCLIV. fig. 1. (A.)

The Gyron is a triangular figure formed by two lines, one drawn diagonally from one of the four angles to the centre of the shield, and the other is drawn either horizontal or perpendicular, from one of the sides of the shield, meeting the other line at the centre of the field.

Gyronny is said, when the field is covered with six, eight, ten, or twelve gyrons in a coat-of-arms: but a French author would have the true gyronny to consist of eight pieces only, as in the fig. which represents the coat-of-arms of Flora Campbell countess of Loudon, &c. whose ancestor was created baron of Loudon in 1604 by James VI. and earl of the same place, May 12. 1633, the 9th of Charles I.

The Franc-quarter is a square figure, which occupies the upper dexter quarter of the shield. It is but rarely carried as a charge. Silvestra Petra Sancta has given us a few instances of its use.

The Canton is a square part of the escutcheon, somewhat less than the quarter, but without any fixed proportion. It represents the banner that was given to ancient knights-bannerets, and, generally speaking, possesses the dexter-chief point of the shield, as in the fig.; but should it possess the sinister corner, which is but seldom, it must be blazoned a canton-sinister.

James Cotes reckons it as one of the nine honourable ordinaries, contrary to most heralds opinion. It is added to coats of arms of military men as an augmentation of honour: thus John Churchill, baron of Eyemouth in Scotland, and one of the ancestors of the present duke of Marlborough, being lieutenant general to King James II. received from him a canton argent, charged with the red-cross of England, added to his paternal coat, "which is Sable, a lion rampant Argent."

The Pairle is a figure formed by the conjunction of the upper half of the saltier with the under half of the pale.

The Fret is a figure representing two little sticks in saltier, with a mascle in the centre interlaced. J. Gibbon terms it, the *heralds true-lovers knot;* but many dissent from his opinion.

Fretty is said when the field or bearings are covered with a fret of six, eight, or more pieces, as in the fig. The word *fretty* may be used without addition, when it is of eight pieces; but if there be less than that number, they must be specified.

The Pile, which consists of two lines, terminating in a point, is formed like a wedge, and is borne engrailed, wavy, &c. as in the fig. It issues in general from the chief, and extends towards the base; yet there are some piles borne in bend, and issuing from other

parts

Sub-Ordinaries.

parts of the field, as may be feen in Plate CCLVII. fig. 12. N° 12, &c.

The Orle is an ordinary compofed of two lines going round the fhield, the fame as the bordure, but its breadth is but one half of the latter, and at fome diftance from the brim of the fhield, as in the fig.

The Inefcutcheon is a little efcutcheon borne within the fhield; which, according to Guillim's opinion, is only to be fo called when it is borne fingle in the fefs point or centre; fee the fig. on Plate CCLIV. but modern heralds, with more propriety, give the name of *inefcutcheon* to fuch as are contained in Plate CCLVII. fig. 12. N° 2. and call that which is fixed on the fefs-point *efcutcheon of pretence*, which is to contain the arms of a wife that is an heirefs, as mentioned above.

The Treffure is an ordinary commonly fuppofed to be the half of the breadth of an orle, and is generally borne flowery and counter-flowery, as it is alfo very often double, and fometimes treble. See the fig. (Plate CCLIV). This double-treffure makes part of the arms of Scotland, as marfhalled in the royal atchievement, Plate CCLIX. fig. 21. N° 7. and was granted to the Scots kings by Charlemagne, being then emperor and king of France, when he entered into a league with Achaius king of Scotland, to fhow that the French lilies fhould defend and guard the Scottifh lion.

Plate CCLIV.

The Annulet, or ring, is a well known figure, and is frequently to be found in arms through every kingdom in Europe.

The Flanches are formed by two curved lines, or femicircles, being always borne double. See the figure. W. Leigh obferves, that on two fuch Flanches two fundry coats may be borne.

The Flafques refemble the flanches, except that the circular lines do not go fo near the centre of the field; (fee the figure). J. Gibbon would have thefe two ordinaries to be both one, and wrote *flank;* alleging, that the two other names are but a corruption of this laft: but as G. Leigh and J. Guillim make them two diftinct and fubordinate ordinaries, we have inferted them here as fuch.

The Voiders are by Guillim confidered as a fubordinate ordinary, and are not unlike the flafques (fee the figure), but they occupy lefs of the field.

The Billet is an oblong fquare figure, twice as long as broad. Some heralds imagine, that they reprefent bricks for building; others more properly confider them as reprefenting folded paper or letters.

The Lozenge is an ordinary of four equal and parallel fides, but not rectangular; two of its oppofite angles being acute, and the other two obtufe. Its fhape is the fame with thofe of our window-glaffes, before the fquare came fo much in fafhion. See the figure.

Gutts, or drops, are round at bottom, waved on the fides, and terminate at the top in points. Heralds have given them different names according to their different tinctures: thus if they are

Yellow White Red Blue	they are called	*d'Or* *d'Eau* *de Sang* *de Larmes*
Green Black	they are called	*de Vert* *de Poix.*

Sub-Ordinaries.

The Fufil is longer than the lozenge, having its upper and lower part more acute and fharp than the other two collateral middle parts, which acutenefs is occafioned by the fhort diftance of the fpace between the two collateral angles; which fpace, if the fufil is rightly made, is always fhorter than any of the four equal geometrical lines whereof it is compofed. See the fig. *ibid.*

The Ruftre is a lozenge pierced round in the middle (fee the figure.) They are called by the Germans *rutten.* Meneftrier gives an example of them in the arms of Lebaret in France, argent three ruftres azure.

The Mafcle is pretty much like a lozenge, but voided or perforated through its whole extent, fhowing a narrow border, as in the figure. Authors are divided about the refemblance; fome taking it for the mafh of a net, and others for the fpots of certain flints found about Rohan; and as no writer has given a clearer account in fupport of this laft opinion than Colombiere, author of *La Sciénce Heraldique*, we fhall tranfcribe it for the fatisfaction of the curious.

"Rohan (fays he) bears Gules, nine Mafcles Or, 3, 3, 3. Opinions have varied very much about the original of the mafcles or mafhes, as being fomewhat like the mafhes of nets: but for my own part, having often obferved that thofe things which are remarkable and fingular in fome countries, have fometimes occafioned the lords thereof to reprefent them in their efcutcheons, and to take them for their arms, I am of opinion, that the lords of Rohan, who, I believe, are the firft that bore thofe figures in their arms though defcended from the ancient kings and princes of Bretagne, took them, becaufe in the moft ancient vifcounty of Rohan, afterwards erected into a duchy, there are abundance of fmall flints, which being cut in two, this figure appears on the infide of them; as alfo the carps, which are in the fifh-ponds of that duchy, have the fame mark upon their fcales; which, being very extraordinary and peculiar to that country, the ancient lords of the fame had good reafon, upon obferving that wonder, to take thofe figures for their arms, and to trafmit them to their pofterity, giving them the name of *macles*, from the Latin word *macula*, fignifying a fpot; whence fome of that houfe have taken for their motto, *Sine macula macla*, that is, A mafcle without a fpot."

Papillone is an expreffion ufed for a field or charge that is covered with figures like the fcales of a fifh. Monf. Baron gives as an example of it the arms of Monti, Gueules Papelone d'Argent. The proper term for it in Englifh would be *fcallop work.*

Diapering is faid of a field or charge fhadowed with flourifhings or foliage with a colour a little darker than that on which it is wrought. The Germans frequently ufe it; but it does not enter into the blazoning or defcription of an arms, it only ferves to embellifh the coat.

If the fore-mentioned ordinaries have any attributes, that is, if they are engrailed, indented, wavy, &c. they muft be diftinctly fpecified, after the fame manner as the honourable ordinaries.

See examples of fubordinaries, &c. fig. xii.

1. "Gules,

Sub-Ordinaries. Plate CCLVII.

1. "Gules, an Orle Ermine;" borne by the name of *Humframville*.

2. "Argent, three Inescutcheons Gules;" borne by the name of Hay, and the 2d and 3d quarters in the coat-of-arms of the right hon. Thomas Hay, earl of Kinnoul, &c.—The first of the name of Hay that bore these arms, got them, as Mr Nisbet observes, because he and his two sons, after having defeated a party of the Danes at the battle of Loncarty, anno 942, were brought to the king with their shields all stained with blood.

3. "Argent, a Fret Sable;" borne by the right hon. Lionel Talmash, earl of Dysart, &c. This family was advanced to the peerage by King Charles I. in 1646.

4. "Or fretty of Gules, a Canton Ermine;" borne by the right hon. Henry Noel, earl of Gainsborough, &c. This nobleman is descended from —— Noel, who came into England with William the Conqueror, and, in consideration of his services, obtained a grant of several manors and lands of very great value. Sir Edward, who was knighted by King James on his accession to the throne, and created a baronet June 29. 1611, was the first advanced to the honour of Baron Noel, March 23. 1616.

5. "Girony of eight Pieces Or and Sable;" the 1st and 4th quarters of the coat-of-arms of the right hon. John Campbell, earl of Breadalbane, &c. This ancient and noble family is descended, in a regular succession, from Duncan the first Lord Campbell, ancestor of the family of Argyll. John, the first earl, in consideration of his personal merit, was, from a baronet, created Lord Campbell, Viscount Glenorchie, and earl of Breadalbane, Jan. 28. 1677, by Charles II.

6. "Lozengy Argent and Gules;" borne by the right hon. George Fitz-William, Earl Fitz-William, &c. This noble earl is descended from Sir William Fitz-William, marshal of the army of William the Conqueror at the battle of Hastings in Sussex, by which victory that prince made his way to the throne.

7. "Sable, a Mascle within a Tressure flowery Argent;" borne by the name of *Hoblethorne*.

8. "Gules, three Mullets Or, within a Bordure of the latter, charged with a double Tressure flowery and counter-flowery with Fleurs-de-lis of the first;" borne by the noble family of Sutherland, &c. This family, in the peerage, is among the oldest in Britain, if not in all Europe; the title of *earl* being conferred on one of their ancestors in 1067.

9. "Azure, a Pile Ermine," for the name of *Wyche;* and is quartered as first and fourth in the coat-of-arms of Sir Cyril Wyche, Bart.

10. "Or, on a Pile engrailed Azure, three Crosscroslets fitchy of the first;" borne by the name of *Rigdon*.

11. "Or, on a Pile Gules three Lions of England between six Fleurs-de-lis Azure;" the first and fourth quarters of his grace Edward Seymour, duke of Somerset, &c. granted him by King Henry VIII. on his marriage with the lady Jane Seymour.

12. "Ermine, two Piles issuing from the dexter and sinister sides, and meeting in base Sable;" for the name of *Holles*.

13. "Argent, three Piles, one issuing from the Chief between the others reversed, Sable;" for the name of *Hulse*, and borne by Sir Edward Hulse, Bart.

Common Charges.

14. "Azure, a Pile wavy bendways Or;" borne by the name of *Aldham*.—There is no mention made of its issuing out of the dexter corner of the escutcheon, for this is sufficiently determined by the term *bendways*.

15. "Or, three Piles in Bend, each point enseigned with a Fleur-de-lis Sable;" borne by the name of *Norton*.

16. "Argent, three Piles meeting near the point of the base Azure;" borne by the name of *Bryan*.

17. "Party per Pale and per Bend Or and Azure counterchanged;" borne by the name of *Johnson*.—This bearing is equal to two gyrons; see p. 412. col. 2.

18. "Party per Pale and per Cheveron Argent and Gules counterchanged."

19. "Party per Pale chappé Or and Vert counterchanged." This is a bearing seldom to be met with.

20. "Party per Fess Gules and Argent, a Pale counterchanged;" borne by the name of *Lavider*.

Sect. III. *Of Common Charges borne in Coats-of-arms.*

It has been already observed, that in all ages men have made use of the representation of living creatures, and other symbolical signs, to distinguish themselves in war; and that these marks, which were promiscuously used for hieroglyphics, emblems, and personal devices, gave the first notion of heraldry. But nothing shows the extent of human wit more, than the great variety of these marks of distinction, since they are composed of all sorts of figures, some natural, others artificial, and many chimerical; in allusion, it is to be supposed, to the state, quality, or inclination of the bearer.

Hence it is, that the sun, moon, stars, comets, meteors, &c. have been introduced to denote glory, grandeur, power, &c. Lions, leopards, tygers, serpents, stags, &c. have been employed to signify courage, strength, prudence, swiftness, &c.

The application to certain exercises, such as war, hunting, music, &c. has furnished lances, swords, pikes, arms, fiddles, &c. Architecture, columns, cheverons, &c.; and the other arts several things that relate to them.

Human bodies, or distinct parts of them, also clothes, and ornaments, have, for some particular intention, found place in armory; trees, plants, fruits, and flowers, have likewise been admitted to denote the rarities, advantages, and singularities, of different countries.

The relation of some creatures, figures, &c. to particular names, has been likewise a very fruitful source of variety in arms. Thus the family of Coningsby bears three coneys; of Arundel, six swallows; of Urson, a bear; of Lucie, three pikes, in Latin *tres lucios pisces;* of Starkey, a stork; of Castleman, a castle triple-towered; of Shuttleworth, three weavers shuttles, &c.

Besides these natural and artificial figures, there are chimerical or imaginary ones used in heraldry, the result of fancy and caprice; such as centaurs, hydras, phœnixes, griffons, dragons, &c. Which great variety of figures shows the impossibility of comprehending all common

Natural Figures.

common charges in a work of this nature; therefore such only shall be treated of as are most frequently borne in coats-of-arms.

ART. I. *Of Natural Figures borne in Coats-of-arms.*

Among the multitude of natural things which are used in coats-of-arms, those most usually borne are, for the sake of brevity as well as perspicuity, distributed into the following classes, viz.

Celestial figures; as, the sun, moon, stars, &c. and their parts.

Effigies of men, women, &c, and their parts.

Beasts; as, lions, stags, foxes, boars, &c. and their parts.

Birds; as, eagles, swans, storks, pelicans, &c. and their parts.

Fishes; as dolphins, whales, sturgeons, trouts, &c. and their parts.

Reptiles and *insects;* as, tortoises, serpents, grasshoppers, &c. and their parts.

Vegetables; as trees, plants, flowers, herbs, &c. and their parts.

Stones; as diamonds, rubies, pebbles, rocks, &c.

These charges have, as well as ordinaries, divers attributes or epithets, which express their qualities, positions, and dispositions. Thus the sun is said to be *in his glory*, *eclipsed*, &c.; the moon, *in her complement*, *increscent*, &c. Animals are said to be *rampant*, *passant*, &c. Birds have also their denominations, such as *close displayed*, &c. Fishes are described to be *hauriant*, *naiant*, &c.

I. *Examples of Celestial Figures.*

Plate CCLVII. fig. 13.

1. "Azure, a Sun in his Glory;" borne by the name of *St Clere;* and is found in the first and fourth quarters of the coat-of-arms of the most noble William-John Ker, marquis of Lothian, &c. It is needless to express the colour of the sun, nothing being capable to denote it but gold.

2. "Azure, one Ray of the Sun, bendways Gules, between six Beams of that Luminary Argent;" borne by the name of *Aldam.* There is no mention made of their issuing out of the dexter-corner of the escutcheon; for this is implied in the term *bendways*, for the reason mentioned before.

3. "Argent, five rays of the Sun issuing out of the sinister corner Gules;" borne by the name of *Mudtshideler*, a family of distinction in Franconia.

4. "Or, a Sun eclipsed." This bearing is seldom to be met with, except in emblematic or hieroglyphic figures; and might be expressed *Sable*, because that hue is accidental and not natural.

5. "Gules, the Moon in her complement Or, illustrated with all her light proper." This is sufficient without naming the colour, which is *Argent.*

6. "Azure, a Moon decrescent proper;" borne by the name of *Delaluna.*

7. "Gules, a Moon increscent Or;" borne by the name of *Descus.*

8. "Argent, a Moon in her *detriment*, Sable." This word is used in heraldry to denote her being eclipsed.

9. "Azure, a Crescent Argent;" borne by the name of *Lucy.* This bearing is also used as a difference, it being assigned to the second son, as before-mentioned.

Celestial Figures.

10. "Gules, three Crescents Argent;" borne by Oliphant, Lord Oliphant (at present dormant). Amongst the ancestors of this noble family was David de Oliphant, one of those barons who, in 1142, accompanied King David I. into England with an army, to assist his niece Matilda against King Stephen; but after raising the siege of Winchester, the said King David was so closely pursued, that, had it not been for the singular conduct of this brave person, the king would have been taken prisoner.

11. "Azure, a Crescent between three Mullets Argent;" borne by Arbuthnot, Viscount and Baron Arbuthnot. In the year 1105, the first of this family marrying a daughter of the family of Oliphard, sheriff of the county of Kincardin, with her he had the lands of Arbuthnot in that county, from whence he took his surname. Robert Arbuthnot was the first of this family who, for his loyalty to King Charles I. was Nov. 16. 1641, dignified with the title of *Baron* and *Viscount Arbuthnot.*

12. "Gules, a Star issuing from between the Horns of a Crescent Argent."

13. "Azure, a Star of 16 points Argent;" borne by the name of *Huitson.*

14. "Argent, three Mullets pierced Sable;" borne by the name of *Wollaston.*

15. "Azure, six Mullets, 3, 2, 1, Or;" borne by the name of *Welsh.*

16. "Ermine, a Mullet of six points Gules, pierced;" borne by the name of *Hessenhul.*—When a mullet has more than five points, their number must, in blazoning, be always named.

17. "Argent, a Rainbow with a Cloud at each end proper." This is part of the crest to the earl of Hopeton's coat-of-arms, which is inserted in fig. ix. N° 13. The whole of it is a globe split on the top, and above it is the rainbow, &c.

18. "Party per Fess crenelle Gules and Azure, three Suns proper;" borne by the name of *Pierson.*

19. "Gules, a Mullet between three Crescents Argent;" borne by the name of *Oliver.*

20. "Gules, a Chief Argent, on the lower part thereof a Cloud, the Sun's resplendent rays issuing throughout proper;" borne by the name of *Leeson.*

II. *Examples of Effigies of Men, &c. and their Parts.*

1. "Azure, the Virgin Mary crowned, with her Babe in her right arm and a sceptre in her left, all Or;" the coat-of-arms of the bishopric of Salisbury. Fig. 14.

2. "Azure, a Presbyter sitting on a Tomb-stone, with a Crown on his head and a Glory Or, his right hand extended, and holding in his left an open Book Argent, with a Sword cross his mouth Gules;" the coat-of-arms of the bishopric of Chichester.

3. "Azure, a Bishop habited in his pontificals sitting on a chair of state, and leaning on the sinister side thereof, holding in his left hand a Crosier, his right being extended towards the dexter chief of the escutcheon, all Or, and resting his feet on a cushion Gules, tasseled of the second;" the coat-of-arms of the bishoprick of Clogher in Ireland.

4. "Azure, a Bishop habited in his pontificals, holding before him, in a Pale, a Crucifix proper;" the

Effigies of Men.

the coat of arms of the bishop of Waterford in Ireland.

5. "Or, a man's Leg couped at the midst of the thigh Azure;" borne by the name of *Haddon.*

6. "Azure, three sinister Hands couped at the wrist, and erected Argent;" borne by the ancient family of Malmains.

7. "Argent, three sinister hands couped at the wrist, and erected Gules;" borne by the name of *Maynard.*—By these two last examples it appears that different coats of arms may be easily made from the same figure or figures, by varying the colours only, without the addition of any other charge, counter-changings, partings, &c.

8. "Argent, a Man's Leg erased at the midst of the thigh Sable;" borne by the name of *Prime.*

9. "Gules, three Legs armed proper, conjoined in the Fess point at the upper part of the thighs, flexed in triangles, garnished and spurred, Or." This is the coat of arms of the Isle of Man; and is quartered by the most noble John Murray, duke of Athol, titular lord or king of that isle.

10. "Gules, three dexter Arms vambraced fessways, in Pale proper;" borne by the name of *Armstrong.* This coat is very well adapted to the bearer's name, and serves to denote a man of excellent conduct and valour.

11. "Or, three Legs couped above the knee Sable;" borne by the name of *Hosy.*

12. "Vert, three dexter Arms conjoined at the shoulders in the Fess-point, and flexed in triangle Or, with fists clenched Argent;" borne by the name of *Tremain.*

13. "Argent, a Man's Heart Gules, within two equilateral triangles interlaced Sable;" borne by the name of *Villages,* a family of distinction in Provence.

14. "Azure, a sinister Arm, issuing out of the dexter-chief, and extended towards the sinister-base Argent."

15. "Argent, a dexter Hand couped at the wrist and erected, within a bordure engrailed Sable;" borne by the name of *Manley.*

16. "Argent, a Man's Heart Gules, ensigned with a Crown Or, and on a Chief Azure, three Mullets of the first." The paternal coat of the name of *Douglas,* and quartered in the arms of the dukes of Hamilton and Queensberry; as also in those of the earls of Morton and March, and the lord Mordington.

17. "Gules, a Saracen's Head affrontée erased at the neck Argent, environed about the temples with a wreath of the second and Sable;" borne by the name of *Mergith.*

18. "Argent, three Blackamoors Heads couped proper, banded about the head Argent and Gules;" borne by the name of *Tanner.*

19. "Gules, three Besants, each charged with a man's face affrontée proper;" borne by the name of *Gamin.*

20. "Or, a Blackamoor's Head couped proper, banded about the head Argent;" borne by the name of *Ussoc.*

Observe, that when half of the face, or little more, of human figures, is seen in a field, it is then said to be *in profile;* and when the head of a man, woman, or other animal, is represented with a full face, then it is termed *affrontée.*

Positions of Lions.

III. *Examples of the different Positions of Lions,* &c. *in Coats-of-Arms.*

1. "Or, a Lion rampant Gules;" quartered by Percy, duke of Northumberland, &c. Fig. 15.

2. "Azure, a Lion rampant-guardant Or;" borne by the name of *Fitz-Hammond.*

3. "Gules, a Lion rampant-reguardant Or;" quartered by Cadogan, Lord Cadogan, &c.

4. "Ermine, a Lion saliant Gules;" borne by the name of *Worley.*

5. "Azure, a Lion statant-guardant Or;" borne by the name of *Bromfield.*

6. "Or, a Lion passant Gules;" borne by the name of *Games.*

7. "Argent, a Lion passant guardant Gules crowned Or;" quartered by the right honourable James Ogilvy, earl of Findlater, &c.

8. "Gules, a Lion sejant Argent."

9. "Or, a Lion rampant double-headed Azure;" borne by the name of *Mason.*

10. "Sable, two Lions rampant-combatant Or, armed and langued Gules;" borne by the name of *Carter.*

11. "Azure, two Lions rampant-adossée Or." This coat-of-arms is said to have been borne by Achilles at the siege of Troy.

12. "Sable, two Lioncels counter-passant Argent, the uppermost towards the sinister side of the escutcheon, both collared Gules;" borne by the name of *Glegg.*—It is the natural disposition of the lion not to bear a rival in the field: therefore two lions cannot be borne in one coat-of-arms, but must be supposed to be lion's whelps, called *lioncels;* except when they are parted by an ordinary, as in fig. viii. N° 17. or so disposed as that they seem to be distinctly separated from each other, as in fig. xv. N° 20. In the two foregoing examples they are called *lions,* because in the 10th they seem to be striving for the sovereignty of the field, which they would not do unless they were of full growth; and in the 11th they are supposed to represent two valiant men, whose dispute being accommodated by the prince, are leaving the field, their pride not suffering them to go both one way.

13. "Argent, a Demi-lion rampant Sable;" borne by the name of *Mervin.*

14. "Gules, a Lion couchant between six Crosscrosslets, three in Chief, and as many in Base, Argent;" for the name of *Tynte;* and is the first and fourth quarter of the arms of Sir Charles-Kemys Tynte, Bart.

15. "Azure, a Lion dormant Or."

16. "Or, out of the midst of a Fess Sable, a Lion rampant naissant Gules;" borne by the name of *Emme.* This form of blazon is peculiar to all living things that shall be found issuing out of the midst of some ordinary or other charge.

17. "Azure, three Lioncels rampant Or;" borne by Fienes, Viscount and Baron Saye and Sele.

18. "Gules, a tricorporated Lion issuing from three parts of the Escutcheon, all meeting under one Head in the Fess-point Or, langued and armed Azure;" borne

borne by the name of *Crouchback*. This coat appertained to Edmund Crouchback earl of Lancaster, in the reign of his brother King Edward I.

19. " Gules, a besant between three Demi-lions rampant Argent;" borne by Bennet, earl of Tankerville, &c. This noble earl is descended from the family of the Bennets in Berkshire, who flourished in the reign of King Edward III. Charles, Lord Offulston, was created earl of Tankerville on October 19. 1714, by George I.

20. " Party per Pale Azure and Gules, three Lions rampant Argent;" borne by Herbert earl of Pembroke, &c. This noble family is descended from Henry Fitz-Roy, natural son to Henry I. Sir William Herbert, one of the ancestors of the present earl, was master of the horse to King Henry VIII. lord president of the marches of Wales, and knight of the garter. He was also, by that king, advanced to the dignity of Baron Herbert of Caerdiff, Oct. 10. 1551, and the very next day created earl of Pembroke.—Observe, that if a lion, or any other beast, is represented with its limbs and body separated, so that they remain upon the field at a small distance from their natural places, it is then termed *Dehaché* or *couped in all its parts;* of which very remarkable bearing there is an instance in armoury, which is, " Or, a Lion rampant Gules, dehaché, or couped in all its parts, within a double Tressure flowery and counter-flowery of the second;" borne by the name of *Maitland*.

IV. *Examples of other Quadrupeds, and their Parts, borne in Coats-of-Arms.*

Fig. 16. 1. " Sable, a Camel statant Argent;" borne by the name of *Camel*.

2. " Gules, an Elephant statant Argent, tusked Or."

3. " Argent, a Boar statant Gules, armed Or;" borne by the name of *Trewarthen*.

4. " Sable, a Bull passant Or;" borne by the name of *Fitz-Geffrey*.

5. " Sable, three Nags Heads erased Argent;" borne by Blayney, Baron Blayney of Monaghan, in Ireland. This noble family is descended in a direct line from Cadwallader, a younger son of the prince of Wales; and the first peer was Sir Edward Blayney, knight, who was created a baron by King James I. July 29. 1621.

6. " Argent, three Boars Heads erased and erect Sable, langued Gules," for the name of *Booth*.

7. " Azure, three Boars Heads erased Or;" quartered by his grace Alexander Gordon duke of Gordon, &c. Of this great and noble family, which took their surname from the barony of Gordon in the county of Berwick, there have been, besides those in North Britain, several of great distinction in Muscovy; and in the time of King Malcolm IV. 1160, this family was very numerous, and flourished in the county aforesaid.

8. " Argent, three Bulls Heads erased, Sable, armed Or;" borne by Skeffington, earl of Massareene, &c. of Ireland. This ancient and noble family derives its name from the village of Skeffington, in the county of Leicester, of which place Simon Skeffington was lord in the reign of Edward I. and from him descended Sir William Skeffington, knight, made so by King Henry VII.

9. " Argent, two Foxes counter-saliant, the dexter surmounted of the sinister Gules;" for the name of *Kadrod Hard*, an ancient British family, from which is descended Sir ———— Wynne, Bart. who bears this quartered, second and third, in his coat-of-arms.

10. " Argent, three Bulls passant Sable, armed and unguled Or;" for Ashley, and quartered by the right honourable Anthony-Ashley Cooper, earl of Shaftesbury, &c. This noble earl is descended from Richard Cooper, who flourished in the reign of King Hen. VIII. and purchased the manor of Paulet in the county of Somerset, of which the family are still proprietors. But his ancestor who makes the greatest figure in history is Sir Anthony-Ashley Cooper, who was created Baron Ashley of Winbourn, April 20. 1661, and afterwards earl of Shaftesbury April 23. 1672.

11. " Ermine, three Cats passant in Pale Argent;" for the name of *Adams*.

12. " Gules, two Grehounds rampant Or, respecting each other;" borne by the name of *Dogget*.

13. " Or, an Ass's Head erased Sable;" borne by the name of *Hackwell*.

14. " Gules, three Lions gambs erased Argent;" for the name of *Newdigate*.

15. " Argent, three Lions Tails erected and erased Gules;" borne by the name of *Cork*.

16. " Azure, a Buck's Head cabossed Argent;" borne by Legge, earl of Dartmouth, &c. This noble family is descended from Signior de Lega, an Italian nobleman, who flourished in Italy in the year 1297. What time the family came into England is uncertain; but it appears they were settled at Legge-place, near Tunbridge in Kent, for many generations; and Thomas, one of their ancestors, was twice lord-mayor of London, viz. in 1346 and 1353.

17. " Argent, two Squirrels sejant adossée Gules," for the name of *Samwell*.

18. " Gules, a Goat passant Argent;" borne by the name of *Baker*.

19. " Sable, a Stag standing at gaze Argent;" borne by the name of *Jones*, of Monmouthshire.

20. " Azure, three Holy Lambs Or;" borne by the name of *Row*.

V. *Examples of Birds, Fishes, Reptiles, &c.*

1. " Ermine, an Eagle displayed Sable;" borne by the name of *Beddingfield*. Fig. 17.

2. " Gules, a Swan close proper;" borne by the name of *Leigham*.

3. " Argent, a Stork Sable, membered Gules;" borne by the name of *Starkey*.

4. " Gules, a Pelican in her nest with wings elevated, feeding her young ones Or; vulned proper;" borne by the name of *Carne*.

5. " Argent, three Peacocks in their pride proper;" borne by the name of *Pawne*.

6. " Sable, a Goshawk Argent, perching upon a stock in the Base-point of the Escutcheon of the second, armed, jessed, and belled Or;" borne by the name of *Wheele*.

Birds, Fishes, &c.

7. "Or, a Raven proper;" borne by the name of *Corbet*.

8. "Argent, three Cocks Gules, crested and jowlopped Sable, a Crescent surmounted of a Crescent for difference;" borne by Cockayne, Viscount Cullen, of Donegal in Ireland. Of this ancient family was Andreas Cockayne of Ashburne in the county of Derby, who lived in the 28th year of Edward I. Charles, son to Sir William Cockayne lord-mayor of London, 1619, was the first who was advanced to the peerage, by Charles I. August 11. 1642.

9. "Sable, a Dolphin naiant embowed Or;" borne by the name of *Symonds*. This animal is borne by the eldest son of the French king, and next heir to the crown, no other subject in that kingdom being permitted to bear it. In England, where that rule cannot take place, there are several families that have dolphins in their coats-of-arms.

10. "Argent, three Whales Heads erect and erased Sable;" borne by the name of *Whalley*.

11. "Gules, three Escalops Argent;" borne by Keppel, earl of Albemarle, &c. This family is descended from Arnold Joost van Keppel, a nobleman of the province of Guelderland in Holland, who came over into England with the prince of Orange in 1688, to whom he was then a page of honour, and afterwards master of the robes, and was by him created a peer of England, by the title of earl of Albemarle, in the duchy of Normandy in France, February 10. 1696.

12. "Azure, three Trouts fretted in Triangle Argent;" borne by the name of *Troutbeck*.

13. "Vert, a Grasshopper passant Or."

14. "Azure, three Bees two and one volant in pale Argent;" borne by the name of *Bye*.

15. "Vert, a Tortoise passant Argent;" borne by the name of *Gawdy*.

16. "Gules, an Adder nowed Or;" borne by the name of *Nathiley*. Adders, snakes, and serpents, are said to represent many things, which being according to the fancy of the ancients, and a few modern authors who have adopted their opinions, it is needless to enlarge upon. It is certain they often occur in armory; but the noblest is that of the duchy of Milan, viz. "Argent, a Serpent gliding in Pale Azure, crowned Or, vorant an Infant issuing Gules." The occasion of this bearing was this: Otho, first viscount of Milan, going to the Holy Land with Godfrey of Bouillon, defeated and slew in single combat the great giant Volux, a man of extraordinary stature and strength, who had challenged the bravest of the Christian army. The viscount having killed him, took his armour, and among it his helmet, the crest whereof was a serpent swallowing an infant, worn by him to strike terror into those who should be so bold as to engage him.

17. "Ermine, a Rose Gules barbed and seeded proper;" borne by Boscawen Viscount Falmouth, &c. This family is descended from Richard Boscawen, of the town of Boscawen, in the county of Cornwall, who flourished in the reign of King Edward VI. Hugh, the first peer of this ancient family, was created baron of Boscawen Rose, and Viscount Falmouth, on the 13th of June 1720, 6th of George I.

18. "Azure, three Laurel leaves slipped Or;" borne by the name of *Leveson*, and quartered by the right honourable Granville-Leveson Gower, earl of Gower, &c.

19. "Azure, three Garbs Or;" borne by the name of *Cuming*. These are sheaves of wheat; but though they were barley, rye, or any other corn whatsoever, it is sufficient, in blazoning, to call them *Garbs*, telling the tincture they are of.

20. "Gules, three Cinquefoils Argent;" borne by Lambart, baron of Cavan, &c. in Ireland. Of this ancient family, which is of French extraction, was Sir Oliver, who in the reign of Queen Elizabeth, attending the earl of Essex to Spain, was there knighted by him, and afterwards returning with that earl into Ireland, was, for his singular service in the north against O'Neal earl of Tyrone, made camp-master-general, and president of Connaught; and February 17. 1617, was created Lord Lambart and baron of Cavan by King James I.

It must be observed, that trees and plants are sometimes said to be trunked, eradicated, fructuated, or raguled, according as they are represented in arms.

Artificial Figures.

Art. 2. Of Artificial Figures borne in Coats-of-Arms.

After the various productions of nature, artificial figures, the objects of arts and mechanics, claim the next rank. They may be distributed into the following classes, viz.

Warlike instruments; as swords, arrows, battering-rams, gauntlets, helmets, spears, pole-axes, &c.

Ornaments used in royal and religious ceremonies; as crowns, coronets, mitres, wreaths, crosiers, &c.

Architecture; as towers, castles, arches, columns, plummets, battlements, churches, portcullises, &c.

Navigation; as ships, anchors, rudders, pendants, sails, oars, masts, flags, galleys, lighters, &c.

All these bearings have different epithets, serving either to express their position, disposition, or make: viz. swords are said to be erect, pommeled, hilted, &c.; arrows, armed, feathered, &c; towers, covered, embattled, &c.; and so on of all others, as will appear by the following examples.

1. "Sable, three Swords, their points meeting in the Base Argent, pommeled and hilted Or, a Crescent in chief of the second for difference;" borne by Powlet, duke of Bolton, &c. This noble duke is descended from Hercules, lord of Tournon in Picardy, who came over to England with Jeffrey Plantagenet earl of Anjou, third son of King Henry II. and among other lands had the lordship of Paulet in Somersetshire conferred on him. William Powlet, the first peer of this illustrious and loyal family, was treasurer of the household to King Henry VIII. and by him created Baron St John of Basing, in the county of Southampton, March 9. 1538. Fig. 18.

2. "Argent, three Battering-rams barways in Pale, headed Azure and hooped Or, an Annulet for difference;" borne by Bertie, earl of Abington, &c. The first of the family of Bertie that bore the title of earl of Abington was James Bertie Lord Norris of Rycote, being created earl, Nov. 30. 1682, by Charles II.

3. "Azure, three left-hand Gauntlets with their backs forward Or;" borne by Fane, earl of Westmoreland, &c. This noble earl is descended from the Fanes, an

Artificial Figures.

an ancient family which resided at Badsal in Kent, from which descended Francis Fane, son and heir of Sir Thomas Fane, Knight, by Mary his wife, sole daughter and heiress to Henry Nevil Lord Abergavenny, afterwards created Baroness Despenser. The said Francis was a knight of the bath; and in the reign of King James I. was created Baron Burghersh and earl of Westmoreland Dec. 29. 1624.

4. "Azure, three Arrows their points in base Or;" borne by Archer, Lord Archer, &c. This noble lord is descended from John de Archer, who came over from Normandy with William the Conqueror; and this family is one of the most ancient in Warwickshire, being settled at Umberslade in that county ever since the reign of Henry II. His lordship is the first peer; and was created Lord Archer and baron of Umberslade by King George II. July 14. 1747.

5. "Gules, two Helmets in chief proper, garnished Or, in a Base of a Garb of the third;" borne by Cholmondeley, earl of Cholmondeley, &c. This noble earl is descended from the ancient family of Egerton in Cheshire, which flourished in the time of the conquest, from whom also the duke of Bridgewater was descended. The first English peer of this branch was Hugh Viscount Cholmondeley of Kells, in Ireland, who, joining with those who opposed the arbitrary measures of King James II. was on the accession of King William and Queen Mary created Lord Cholmondeley of Namptwich, in the county of Chester.

6. "Argent, a Ship with its sails furled up Sable;" quartered by Hamilton, earl of Abercorn, &c. The descent of this noble family is from that of the duke of Hamilton: for James, the fourth Lord Hamilton and second earl of Arran, marrying Lady Margaret Douglas daughter of James the third earl of Morton, by her had four sons, James, John, Claud, and David: whereof Claud was progenitor of the lord we are now speaking of; and in consideration of his merit and loyalty to Mary queen of Scots, James VI. created him Lord Paisley in 1591, as also earl of Abercorn, baron of Hamilton, &c. July 10. 1606.

7. "Or, an Anchor in pale Gules;" quartered by the most noble George Johnston, marquis of Annandale, &c. The Johnstons are an ancient and warlike family, and derive their surname from the barony of Johnston in Annandale.

8. "Sable, three Spears heads erect Argent, imbrued Gules, on a chief Or, as many Pole-axes Azure;" borne by King, Lord King, &c. Peter King, Esq. the first lord of this ancient family, was chosen recorder of the city of London, July 27. 1708, and on the 12th of September following had the honour of knighthood conferred on him. He was constituted lord-chief-justice of the common pleas in the first year of King George I. 1714; on the 5th of April following was sworn of his majesty's most honourable privy-council, and on May 19. 1723 was created a peer of this kingdom by the title of Lord King, baron of Ockham.

9. "Gules, three Clarions Or;" quartered by Carteret, earl of Granville, &c. This ancient family derives its pedigree from Offerey de Carteret, who attended William the Conqueror in his descent upon England, and contributed to the victory he obtained over King Harold, at Hastings in Sussex, 1066: he had manors and lands in England conferred on him by that prince, as a reward for his eminent services. George the first earl was, in consideration of his own merit and the services of his ancestors, created a peer of Great Britain, October 19. 1681.

Artificial Figures.

10. "Argent, a Maunch Sable;" borne by Hastings, earl of Huntingdon, &c. This family is descended from Hugh de Hastings, a younger son of the ancient and noble family of the Hastings, earl of Pembroke, of which family was William de Hastings, steward of the household to King Henry I.—William, the first Lord Hastings, was created a baron on July 6. 1461, by King Edward IV.

11. "Azure, a circular Wreath Argent and Sable, with four Hawks Bells joined thereto in quadrature Or;" borne by Jocelyn, Viscount Jocelyn, &c. This noble family is of great antiquity; for, after the Romans had been masters of Britain 500 years, wearied with the wars, they took their final farewel of it, and carried away with them a great many of their brave old British soldiers, who had served them in their wars both at home and abroad, to whom they gave Amorica in France, for their former services, which country was from them afterwards called *Little Britain.* It is supposed that there were some of this family amongst them; and that they gave the name of *Jocelyn* to a town in this country, which still preserves that name; and it is thought probable that they returned with William the Conqueror; for we find, in 1066, mention made of Sir Gilbert Jocelyn. The first lord of the family, was created Baron Newport, of Newport in Ireland, on Nov. 29. 1743, and viscount in Nov. 1751.

12. "Gules, three Towers Argent;" quartered by Fowler, Viscount Ashbrook, &c. William Fowler, Esq. was advanced to the peerage by King George II. and created baron of Castle Durrow, in the county of Kilkenny, Oct. 27. 1733; and his son was created Viscount Ashbrook, of Ashbrook in Ireland, on September 30. 1751; now extinct.

13. "Gules, two Keys in Saltier Argent, in Chief a Royal Crown proper;" the arms of the archbishopric of York.

14. "Gules, two Swords in Saltier Argent, pommeled and hilted Or;" the arms of the bishopric of London.

15. "Sable, a Key in Bend, surmounted by a Crosier in Bend sinister, both Or;" the arms of the bishopric of St Asaph.

16. "Gules, two Keys adossée in Bend, the uppermost Argent, the other Or, a Sword interposed between them in Bend-sinister of the second, pommeled, and hilted of the third;" the arms of the bishopric of Winchester.

17. "Gules, three Mitres with their pendants Or;" the arms of the bishopric of Chester.

18. "Sable, three Ducal Coronets paleways Or;" the arms of the bishopric of Bristol.

19. "Gules, a Sword erect in pale Argent, pommeled and hilted Or, surmounted by two Keys in Saltier of the last;" the arms of the bishopric of Exeter.

20. "Gules, three Ducal Coronets, Or;" the arms of the bishopric of Ely.

Chimerical Figures.

Art. 3. Of Chimerical Figures.

The laſt and the oddeſt kind of bearings in coats-of-arms, is comprehended under the name of *chimerical figures;* that is to ſay, ſuch as have no real exiſtence, but are mere fabulous and fantaſtical inventions. Theſe charges, griffons, martlets, and unicorns excepted, are ſo uncommon in Britiſh coats, that in order to make up the ſame number of examples hitherto contained in each collection, ſeveral foreign bearings are introduced here; which, however, as they are conform to the laws of heraldry, will alſo contribute both to entertain and inſtruct the reader. Thoſe moſt in uſe are the following, viz.

Angels, Cherubims, Tritons, Centaurs, Martlets, Griffons, Unicorns, Dragons, Mermaids, Satyrs, Wiverns, Harpies, Cockatrices, Phœnixes.

Theſe, like the foregoing charges, are ſubject to various poſitions and diſpoſitions, which, from the principles already laid down, will be plainly underſtood from the following examples.

Fig. 19. N° 1. is "Gules, an Angel ſtanding affrontée, with his hands conjoined and elevated upon his breaſt, habited in a long Robe cloſe girt Argent, his Wings diſplayed Or;" borne by the name of *Brangor de Cerevisia*, a foreign prelate, who aſſiſted at the council of Conſtance, 1412. This example is quoted by Guillim, Sect. III. Chap. I.

2. "Sable, a Cheveron between three Cherubim Or;" borne by the name of *Chaloner*, of Yorkſhire and Cheſhire.

3. "Azure, a Feſs indented between three Cherubim Argent." Theſe arms were granted to John Ayde, Eſq. of Doddington in Kent, by Sir William Segar, garter.

4. "Gules, a Cherub having three pair of Wings, the uppermoſt and lowermoſt counter-croſſed Saltierways, and the middlemoſt diſplayed Argent;" borne by the name of *Buocaſoco*, a foreign prelate. This example is copied from Meneſtrier's *Methode du Blaſon*, p. 120. N° viii.

5. "Azure, a Griffon ſegreant Or, armed and langued Gules, between three Creſcents Argent;" quartered by Bligh, Lord Clifton, &c. The anceſtor of this noble family, who lived in London, going over to Ireland in the time of Oliver Cromwell, as an agent to the adventurers there, acquired a good eſtate, and laid the foundation for the grandeur of this family.

6. "Gules, three Martlets Or;" borne by the name of Macgill. Guillim obſerves, that this bird, which is repreſented without feet, is given for a difference to younger brothers, to put them in mind, that, in order to raiſe themſelves, they are to truſt to their wings of virtue and merit, and not to their legs, having but little land to ſet their feet on.

7. "Azure, three Mullets Argent within a double Treſſure counter-flowery Or, in the centre a Martlet of the laſt;" borne by Murray, Lord Elibank. Sir Gideon Murray, knighted by King James VI. by whom he was made treaſurer-depute, was third ſon of Sir Andrew Murray of Blackbarony. His ſon Patrick, in reſpect of his loyalty to Charles I. was on May 16. 1628 made a baronet, and in 1643 created Lord Elibank.

8. "Sable, a Cockatrice diſplayed Argent, creſted, membered, and jowllopped Gules."

Crowns.

9. "Argent, a Mermaid Gules, crined Or, holding in her right hand a Comb, and in her left a Mirror, both proper;" borne by the name of *Ellis*.

10. "Argent, a Wivern, his Wings elevated, and his Tail nowed below him Gules;" borne by the name of *Drakes*.

11. "Or, a Dragon paſſant Vert."

12. "Gules, a Centaur or Sagittary in full ſpeed reguardant proper." This was the coat of arms of Stephen ſurnamed of *Blois*, ſon to Adela daughter of William the Conqueror, and of Stephen earl of Blois; and on this deſcent grounding his pretenſion to the crown of England he was proclaimed king in 1135, and reigned to the 25th of October 1154.

13. "Argent, an Unicorn ſejant Sable, unguled and horned Or;" borne by the name of *Harling*.

14. "Argent, a Dragon's Head eraſed Vert, holding in his Mouth a ſiniſter Hand couped at the Wriſt Gules;" borne by the name of *Williams*.

15. "Gules, three Unicorns Heads couped Or;" borne by the name of *Paris*.

16. "Argent, a Wivern volant Bendways Sable;" borne by the name of *Raynon*.

17. "Azure, a Lion Sejant guardant winged Or, his Head encircled with a Glory, holding in his forepaws an open book, wherein is written, *Pax tibi, Marce, Evangeliſta meus;* over the dexter ſide of the Book a Sword erect, all proper." Theſe are the arms of the republic of Venice.

18. "Azure, a Bull ſaliant and winged Or," borne by the name of *Cadenet*, a family of diſtinction of Provence.

19. "Argent, a Wivern with a human Face affrontée hooded, and winged Vert," borne by the name of *Buſeraghi*, an ancient and noble family of Luques.

20. "Azure, a Harpy diſplayed, armed, crined, and crowned Or." Theſe are the arms of the city of Nuremberg in Germany.

To the forementioned figures may be added the montegre, an imaginary creature, ſuppoſed to have the body of a tyger with a ſatyr's head and horns; alſo thoſe which have a real exiſtence, but are ſaid to be endowed with extravagant and imaginary qualities, viz. the ſalamander, beaver, cameleon, &c.

Chap. IV. *Of the External Ornaments of Eſcutcheons.*

The ornaments that accompany or ſurround eſcutcheons were introduced to denote the birth, dignity, or office, of the perſons to whom the coat-of-arms appertaineth; which is practiſed both among the laity and clergy. Thoſe moſt in uſe are of ten ſorts, viz. Crowns, Coronets, Mitres, Helmets, Mantlings, Chapeaux, Wreaths, Creſts, Scrolls, Supporters.

Sect. I. *Of Crowns.*

The firſt crowns were only diadems, bands, or fillets; afterwards they were compoſed of branches of divers trees, and then flowers were added to them.

Among

Crowns.

Among the Greeks, the crowns given to those who carried the prize at the Isthmian games, were of pine; at the Olympic, of laurel; and at the Nemean, of smallage.

The Romans had various crowns to reward martial exploits and extraordinary services done to the republic; for which see the detached article CROWN in this Dictionary, and Plate CLXIV.

Examples of some of these crowns are frequently met with in modern atchievements, viz. 1. The *mural* crown in that of Lord Montfort, which was conferred on Sir John Bromley, one of his lordship's anceftors, as an augmentation to his arms, for his great courage at the battle of Le Croby. Part of the crest of Lord Archer is also a mural crown. And there are no less than ten English baronets, whose arms are ornamented with the same crown. 2. The *naval* or rostral crown is still used with coats-of-arms, as may be seen in those of Sir William Burnaby, Bart. now admiral of the red squadron, and of John Clerke, Esq. as part of their crests. 3. Of the *castrense* or vallary crown, we have instances in the coats-of arms of Sir Reginald Graham, and of Isaac Akerman, Esq. 4. The crest of Grice Blackney, Esq. is encompassed with a *civic* crown. 5. The *radiated* crown, according to J. Yorke, was placed over the arms of the kings of England, till the time of Edward III. It is still used as a crest on the arms of some private families; those, for example, borne by the name of *Whitfield*, are ornamented with it. The celestial crown is formed like the radiated, with the addition of a star on each ray; and is only used upon tomb-stones, monuments, and the like.—Others of the ancient crowns are still borne, as crests, by several families.

But modern crowns are only used as an ornament, which emperors, kings, and independent princes set on their heads, in great solemnities, both to denote their sovereign authority, and to render themselves more awful to their subjects. These are the most in use in heraldry, and are as follows:

Fig. 20. The imperial crown (N° 1.) is made of a circle of gold, adorned with precious stones and pearls, heightened with fleurs-de-lis, bordered and seeded with pearls, raised in the form of a cap voided at the top like a crescent. From the middle of this cap rises an arched fillet enriched with pearls, and surmounted of a mound, whereon is a cross of pearls.

The crown of the kings of Great Britain (2.) is a circle of gold, bordered with ermine, enriched with pearls and precious stones, and heightened up with four crosses pattee and four large fleurs-de-lis alternately; from these rise four arched diadems adorned with pearls, which close under a mound, surmounted of a cross like those at bottom. Mr Sandford, in his Genealogical History, p. 381. remarks, that Edward IV. is the first king of England that in his seal, or on his coin, is crowned with an arched diadem.

The crown of the kings in France (3.) is a circle enamelled, adorned with precious stones, and heightened up with eight arched diadems, rising from as many fleurs de-lis, that conjoin at the top under a double fleur-de-lis, all of gold.

The crowns of Spain, Portugal, and Poland, are all three of the same form, and are, amongst others, thus described by Colonel Parsons, in his Genealogical Tables of Europe, viz. A ducal coronet, heightened up with eight arched diadems that support a mound, ensigned with a plain cross. Those of Denmark and Sweden are both of the same form, and consist of eight arched diadems, rising from a marquis's coronet, which conjoin at the top under a mound ensigned with a cross-bottony.

Coronets.

The crowns of most other kings are circles of gold, adorned with precious stones, and heightened up with large trefoils, and closed by four, six, or eight diadems, supporting a mound, surmounted of a cross.

The Great Turk (4.) bears over his arms a turban, enriched with pearls and diamonds, under two coronets, the first of which is made of pyramidical points heightened up with large pearls, and the uppermost is surmounted with crescents.

The Pope, or bishop of Rome, appropriates to himself a Tiara (N° 5.), or long cap of golden cloth, from which hang two pendants embroidered and fringed at the ends, *semée* of crosses of gold. This cap is enclosed by three marquises coronets; and has on its top a mound of gold, whereon is a cross of the same, which cross is sometimes represented by engravers and painters pometted, recrossed, flowery, or plain.—It is a difficult matter to ascertain the time when the popes assumed the three forementioned coronets. A patched-up succession of the holy pontiffs, engraved and published some years ago by order of Pope Clement XIII. for the edification of his good subjects in Great Britain and Ireland, represents Marcellus, who was chosen bishop of Rome anno 310, and all his successors, adorned with such a cap: but it appears, from very good authority, that Boniface VIII. who was elected into the see of Rome anno 1295, first compassed his cap with a coronet; Benedict XII. in 1335, added a second to it; and John XXIII. in 1411, a third; with a view to indicate by them, that the Pope is the sovereign priest, the supreme judge, and the sole legislator amongst Christians.

SECT. II. *Of Coronets.*

THE coronet of the prince of Wales, or eldest son of the king of Great Britain (N° 7.), was anciently a circle of gold set round with four crosses pattee, and as many fleurs-de-lis alternately; but since the restoration, it has been closed with one arch only, adorned with pearls, and surmounted of a mound and cross, and bordered with ermine like the king's.

Besides the aforesaid coronet, his royal highness the prince of Wales has another distinguishing mark of honour, peculiar to himself, called by the vulgar the *prince's arms*, viz. A plume of three ostrich-feathers, with an ancient coronet of a prince of Wales. Under it, in a scroll, is the motto, *Ich Dien*, which in the German or old Saxon language signifies, "I serve;" (see N° 6.). This device was at first taken by Edward prince of Wales, commonly called the *black prince*, after the famous battle of Cressy, in 1346, where having with his own hand killed John king of Bohemia, he took from his head such a plume, and put it on his own.

The coronet of all the immediate sons and brothers of the kings of Great Britain, is a circle of gold, bordered

Mitres.

bordered with ermine, heightened up with four fleurs-de-lis, and as many crosses pattee alternate, (see N° 8.).—The particular and distinguishing form of such coronets as are appropriated to princes of the blood-royal, is described and settled in a grant of Charles II. the 13th of his reign.

The coronet of the princesses of Great Britain is a circle of gold, bordered with ermine, and heightened up with crosses-pattee, fleurs-de-lis, and strawberry leaves alternate (N° 9.); whereas a prince's coronet has only fleurs-de-lis and crosses.

A duke's coronet is a circle of gold bordered with ermine, enriched with precious stones and pearls, and set round with eight large strawberry or parsley leaves; (N° 10.).

A marquis's coronet is a circle of gold, bordered with ermine, set round with four strawberry leaves, and as many pearls on pyramidical points of equal height, alternate; (N° 11.).

An earl's coronet is a circle of gold, bordered with ermine, heightened up with eight pyramidical points or rays, on the tops of which are as many large pearls, and are placed alternately, (with as many strawberry-leaves, but the pearls much higher than the leaves: (N° 12.).

A viscount's coronet differs from the preceding ones as being only a circle of gold bordered with ermine, with large pearls set close together on the rim, without any limited number, which is the prerogative above the baron, who is limited: (see N° 13.).

A baron's coronet, (N° 14.), which was granted by King Charles II. is formed with six pearls set at equal distances on a gold circle, bordered with ermine, four of which only are seen on engravings, paintings, &c. to show he is inferior to the viscount.

The eldest sons of peers, above the degree of a baron, bear their father's arms and supporters with a label, and use the coronet appertaining to their father's second title; and all the younger sons bear their arms with proper differences, but use no coronets.

As the crown of the king of Great Britain is not quite like that of other potentates, so do most of the coronets of foreign noblemen differ a little from those of the British nobility; as for example, the coronet of a French earl is a circle of gold with 18 pearls set on the brim of it; a French viscount's coronet is a circle of gold only enamelled, charged with four large pearls; and a French baron's coronet is a circle of gold enamelled and bound about with a double bracelet of pearls; and these coronets are only used on French noblemen's coats-of-arms, and not worn on their heads, as the British noblemen and their ladies do at the king's coronation.

Sect. III. *Of Mitres.*

The archbishops and bishops of England and Ireland place a mitre over their coats-of-arms. It is a round cap pointed and cleft at the top, from which hang two pendants fringed at both ends; with this difference, that the bishop's mitre is only surrounded with a fillet of gold, set with precious stones, (see fig. 23. N° 6.) whereas the archbishop's issues out of a ducal coronet, (see fig. 20. N° 15.).

Helmets and Mantlings.

This ornament, with other masquerade garments, is still worn by all the archbishops and bishops of the church of Rome, whenever they officiate with solemnity; but it is never used in England, otherwise than on coats of arms, as before-mentioned.

Sect. IV. *Of Helmets.*

The Helmet was formerly worn as a defensive weapon, to cover the bearer's head, and is now placed over a coat-of-arms as its chief ornament, and the true mark of gentility. There are several sorts, distinguished, 1st, by the matter they are made of; 2dly, by their form; and, 3dly, by their position.

1st, As to the matter they are, or rather were, made of: The helmets of sovereigns were of burnished gold damasked; those of princes and lords, of silver figured with gold; those of knights, of steel adorned with silver, and those of private gentlemen of polished steel.

2dly, As to their form: Those of the king and the royal family, and noblemen of Great Britain, are open-faced and grated, and the number of bars serves to distinguish the bearer's quality; that is, the helmet appropriated to the dukes and marquises is different from the king's, by having a bar exactly in the middle, and two on each side, making but five bars in all, (see fig. 21. N° 1.) whereas the king's helmet has six bars, viz. three on each side, (ibid. N° 7.). The other grated helmet with four bars is common to all degrees of peerage under a marquis. The open-faced helmet without bars denotes baronets and knights. The close helmet is for all esquires and gentlemen.

3dly, Their position is also looked upon as a mark of distinction. The grated helmet in front belongs to sovereign princes. The grated helmet in profile is common to all degrees of peerage. The helmet standing direct without bars, and the beaver a little open, denotes baronets and knights. Lastly, the side-standing helmet, with the beaver close, is the way of wearing it amongst esquires and gentlemen. See N° 1, 2, 3, 4, and 7, inserted in fig. 21. *Ornaments.*

Sect. V. *Of Mantlings.*

Mantlings are pieces of cloth jagged or cut into flowers and leaves, which now-a-days serve as an ornament for escutcheons. They were the ancient coverings of helmets, to preserve them, or the bearer, from the injuries of the weather, as also to prevent the ill consequences of their too much dazzling the eye in action. But Guillim very judiciously observes, that their shape must have undergone a great alteration since they have been out of use, and therefore might more properly be termed *flourishings* than *mantlings*. See the examples annexed to the helmets represented in fig. 21.

The French heralds assure us, that these mantlings were originally no other than short coverings which commanders wore over their helmets, and that, going into battles with them, they often, on their coming away, brought them back in a ragged manner, occasioned by the many cuts they had received on their heads: and therefore the more hacked they were, the more

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Chapeaux, Wreaths, &c.

more honourable they were accounted; as our colours in time of war are the more esteemed for having been shot through in many places.

Sometimes skins of beasts, as lions, bears, &c. were thus borne, to make the bearer look more terrible, and that gave occasion to the doubling of mantlings with furs.

Sect. VI. *Of Chapeaux.*

A Chapeau is an ancient hat, or rather cap, of dignity worn by dukes, generally scarlet-coloured velvet on the outside, lined and turned up with fur; of late frequently to be met with above an helmet, instead of a wreath, under gentlemen's and noblemen's crests. Heretofore they were seldom to be found, as of right appertaining to private families; but by the grants of Robert Cooke, Clarencieux, and other succeeding heralds, these, together with ducal coronets, are now frequently to be met with in families, who yet claim not above the degree of gentlemen. See the representation of the chapeau, N° 5. fig. 21.

Sect. VII. *Of Wreaths.*

The Wreath is a kind of roll made of two skains of silk of different colours twisted together, which ancient knights wore as a head-dress when equipped for tournaments. The colours of the silk are always taken from the principal metal and colour contained in the coat-of-arms of the bearer. They are still accounted as one of the lesser ornaments of escutcheons, and are placed between the helmet and the crest: (see fig. 21. N° 6.). In the time of Henry I. and long after, no man, who was under the degree of a knight, had his crest set on a wreath; but this, like other prerogatives, has been unfringed so far, that every body now-a-days wears a wreath.

Sect. VIII. *Of Crests.*

The Crest is the highest part of the ornaments of a coat-of-arms. It is called *crest*, from the Latin word *crista*, which signifies comb or tuft, such as many birds have upon their heads, as the peacock, pheasant, &c. in allusion to the place on which it is fixed.

Crests were formerly great marks of honour, because they were only worn by heroes of great valour, or by such as were advanced to some superior military command, in order that they might be the better distinguished in an engagement, and thereby rally their men if dispersed; but they are at present considered as a mere ornament. The crest is frequently a part either of the supporters, or of the charge borne in the escutcheon. Thus the crest of the royal atchievement of Great Britain is a "Lion guardant crowned," as may be seen in fig. 21. N° 7. The crest of France is a double Fleur-de-luce. Out of the many crests borrowed from supporters, are the following, viz. The duke of Montagu's, "A Griffon's head coup'd Or, back'd and wing'd Sable," the marquis of Rockingham's, "A Griffon's head argent, gorg'd with a ducal coronet: the earl of Westmoreland's, "A Bull's head Argent, py'd Sable, armed Or; and Lord Archer's which is, "Out of a mural crown Or, a Wyvern's head Argent." There are several instances of crests that are relative to alliances, employments, or names; and which on that account have been changed.

The Scroll and Supporters.

Sect. IX. *Of the Scroll.*

The Scroll is the ornament placed above the crest, containing a motto, or short sentence, alluding thereto, or to the bearings; or to the bearer's name, as in the two following instances. The motto of the noble earl of Cholmondeley is, *Cassis tutissima virtus;* i. e. "Virtue is the safest helmet;" on account of the helmet in the coat-of-arms. The motto of the right honourable Lord Fortescue is, *Forte scutum salus ducum;* i. e. "A strong shield is the safety of the commanders;" alluding to the name of that ancient family. Sometimes it has reference to neither, but expresses something divine or heroic; as that of the earl of Scarborough, which is, *Murus æreus conscientia sana;* i. e. "A good conscience is a wall of brass." Others are enigmatical; as that of the royal atchievement, which is *Dieu et mon Droit*, i. e. "God and my right;" introduced by Edward III. in 1340, when he assumed the arms and title of *king of France*, and began to prosecute his claim, which occasioned long and bloody wars, fatal by turns to both kingdoms: or that of the prince of Wales, which is *Ich dien*, "I serve," the origin of which has been already mentioned. Mottos, though hereditary in the families that first took them up, have been changed on some particular occasions, and others appropriated in their stead, instances of which are sometimes met with in the history of families.

Sect. X. *Of Supporters.*

Supporters are figures standing on the scroll, and placed at the side of the escutcheon; they are so called, because they seem to support or hold up the shield. The rise of supporters is, by F. Menestrier, traced up to ancient tournaments, wherein the knights caused their shields to be carried by servants or pages under the disguise of lions, bears, griffons, blackamoors, &c. who also held and guarded the escutcheons, which the knights were obliged to expose to public view for some time before the lists were opened. Sir George Mackenzie, who dissents from this opinion, says, in his *Treatise on the Science of Heraldry*, chap. xxxi. p. 93. "That the first origin and use of them was from the custom which ever was, and is, of leading such as are invested with any great honour to the prince who confers it: thus, when any man is created a duke, marquis, or knight of the garter, or any other order, he is supported by, and led to the prince betwixt, two of the quality, and so receives from him the symbols of that honour; and in remembrance of that solemnity, his arms are thereafter supported by any two creatures he chooses." Supporters have formerly been taken from such animals or birds as are borne in the shields, and sometimes they have been chosen as bearing some allusion to the names of those whose arms they are made to support. The supporters of the arms of Great Britain, since King James the First's accession

Supporters. accession to the throne, are *a Lion rampant guardant crowned Or, on the dexter side*, and *an Unicorn Argent, crowned, armed, unguled, maned and gorged with an antique Crown, to which a chain is affixed, all Or*, on the sinister; as it appears by fig. 21. N° 7.

This last figure represents the coat-of-arms of the king of Great Britain, or the royal atchievement, as it has been marshalled since the accession of King George I. in 1714, and is blazoned as follows, viz.

ARMS. *Quarterly, in the first grand quarter Gules, three Lions rampant guardant in pale Or*, the imperial ensigns of England; *impaled with Or, a Lion rampant, within a double tressure flowery and counter-flowery Gules*, the royal arms of Scotland. *The second is Azure, three Fleurs-de-lis Or*, the arms of France. *The third is Azure, a Harp Or, stringed Argent*, the ensign of Ireland. *The fourth grand quarter is Gules, two Lions passant guardant in pale Or*, for Brunswick; *impaled with Or semée of Hearts Proper, a Lion rampant Azure*, for Lunenburg; *with grafted in base Gules a Horse current Argent*, for ancient Saxony; *and in a shield surtout Gules, the Crown of Charlemagne Or*, as arch-treasurer of the empire; *the whole within a Garter, inscribed with this motto*, HONI SOIT QUI MAL Y PENSE, as sovereign of that noble order, given by the founder King Edward III.

CREST. *On a Helmet full-faced, grated and surmounted of a Crown, a Lion guardant crowned Or; the mantlings of the last, and lining, Ermine.*

SUPPORTERS. *On the Dexter side a Lion rampant guards Or, crowned as the Crest. On the Sinister side an Unicorn Argent, crowned, armed, maned, and unguled Or, gorged with an antique Crown; a Chain affixed thereto, reflecting over the back, and passing over the hind legs of the last, both standing on a Scroll inscribed with this motto*, DIEU ET MON DROIT, *from which issue the two Royal Badges of his Majesty's chief Dominions*, viz. *on the Dexter side a Rose party per Pale Argent and Gules, stalked and leaved proper*, for England; *and on the Sinister side a Thistle proper*, for Scotland; being so adorned by King James I. upon his succeeding to the crown of England. As king of Scotland, he bore two unicorns, as above, for his supporters; but upon the union of that kingdom with England, 1603, he introduced one of the above supporters on the sinister side of the royal atchievement, and which continues to this day.

It is to be observed, that bearing coats-of-arms supported, is, according to the heraldrical rules of England, the prerogative, 1st, Of those called *nobiles majores*, viz. dukes, marquises, earls, viscounts, and barons; 2d, Of all knights of the Garter, though they should be under the degree of barons; 3d, Of knights of the Bath, who both receive on their creation a grant of supporters. And, lastly, of such grants as the king chooses to bestow this honour upon; as in the instance of Sir Andrew Fountain, who was knighted by Philip earl of Pembroke, when lord lieutenant of Ireland, Fountain being then his secretary; and on his return to England, King William granted him supporters to his arms, viz. *two Griffins Gules and Or.* In Scotland, all the chiefs of clans or names have the privilege of claiming supporters; also the baronets. But by act of parliament, 10th September 1672, none are allowed to use either arms or supporters, under a penalty and confiscation of all moveables whereon arms are put, without the Lord Lyon's authority.

Rules of Heraldry.

CHAP. V. *Of the Rules or Laws of Heraldry.*

THE several escutcheons, tinctures, charges, and ornaments of coats-of-arms, and their various properties, being now explained; it may not be improper to subjoin such rules for blazoning the same, as the ancient usage and laws of heraldry have established amongst us.

I. The *first* and most general rule is, to express one's self in proper terms, so as not to omit any thing that ought to be specified, and at the same time to be clear and concise without tautology; as in Ex. xiv. Chap. III. art. 1. and also in Ex. 11. art. 7. wherein these expressions *of the Field*, or *of the First*, prevent the repetition of the forementioned tincture.

II. One must begin with the tincture of the field, and then proceed to the principal charges which possess the most honourable place in the shield, such as Fess, Cheveron, &c. always naming that charge first which lies next and immediately upon the field; as in Ex. 15. Chap. III. art. 5.

III. After naming the tincture of the field, the honourable ordinaries, or other principal figures, you must specify their attributes, and afterwards their metal or colour, as in Ex. 16. *Examples of Effigies*, &c.

IV. When an honourable ordinary, or some one figure, is placed upon another, whether it be a Fess, Cheveron, Cross, &c. it is always to be named after the ordinary or figure over which it is placed, with one of these expressions, *sur tout*, or *over all*, as in Ex. 20. Chap. III. art. 4.

V. In the blazoning of such ordinaries as are plain, the bare mention of them is sufficient; but if an ordinary should be made of any of the crooked lines mentioned above, its form must be specified; that is, whether it be Engrailed, Wavy, &c. as in Ex. 1. 2. 3. Chap. III. art 1.

VI. When a principal figure possesses the centre of the field, its position is not to be expressed: or (which amounts to the same thing) when a bearing is named, without specifying the point where it is placed, then it is understood to possess the middle of the shield; as in Ex. 15. *Examples of other Quadrupeds*, &c.

VII. The number of the points of mullets or stars must be specified when more than five; and also if a mullet or any other charge be pierced, it must be mentioned as such, to distinguish it from what is plain; as in Ex. 13. 14. *Examples of Celestial figures.*

VIII. When a ray of the sun, or other single figure, is borne in any other part of the escutcheon than the centre, the point it issues from must be named; as in Ex. 3. *Examples of Celestial figures.*

IX. The natural colour of trees, plants, fruits, birds, &c. is no otherwise to be expressed in blazoning but by the word *proper*, as in Ex. 2. 7. *Examples of Birds*, &c.; but if discoloured, that is, if they differ from their natural colour, it must be particularized; as in Ex. 1. 2. *Examples of other Quadrupeds*, &c.

X. When three figures are in a field, and their position

Marshal-ling. sition is not mentioned in the blazoning, they are always understood to be placed, two above, and one below; as in fig. 23. N° 3.

XI. When there are many figures of the same species borne in a coat-of-arms, their number must be observed as they stand, and distinctly expressed; as in Ex. 1. *Of Artificial Figures, &c.*

But for the better understanding of this last rule, we have inserted examples of the *different dispositions of figures*, wherein they are properly represented, viz.

Two may be ranged in Pale, in Fess, &c. See fig. 22. N° 1 and 2.

Three, may be 2 and 1, as also in Bend, &c. See N° 3 and 4.

Four, are placed 2 and 2, or cantoned, as in N° 5.

Five, 1, 3, 1, in Cross; or 2, 1, 2, in Saltier. See N° 6 and 7.

Six, 3, 2, 1, in Pile; or 2, 2, 2, Paleways. See N° 8 and 9.

Eight, in Orle, or on a Bordure. See N° 10.

Nine, 3, 3, 3, Barways; or 3, 3, 2, 1, in Pile. See N° 11 and 12.

Ten, 4, 3, 2, 1, in Pile; or else 4, 2, 4, Barways. See N° 13 and 14.

Twelve, are placed 4, 4, 4, Barways. See N° 15.

There are other positions called *irregular;* as for example, when three figures which are naturally placed 2 and 1, are disposed 1 and 2, &c. It must also be observed, that when the field is strewed with the same figures, this is expressed by the word *semée*: but, according to a French armorist's opinion, if the figures strewed on the field are whole ones, it must be denoted by the words *sans nombre;* whereas, if part of them is cut off at the extremities of the escutcheon, the word *semée* or *semi* is then to be used.

Chap. VI. *Of Marshalling Coats-of-arms.*

By *marshalling* coats-of-arms, is to be understood the art of disposing divers of them in one escutcheon, and of distributing their contingent ornaments in proper places.

Various causes may occasion arms to be thus conjoined, which J. Guillim comprises under two heads, viz. *manifest* and *obscure*.

What this learned and judicious herald means by *manifest causes* in the marshalling of coats-of-arms, are such as betoken marriages, or a sovereign's gift, granted either through the special favour of the prince, or for some eminent services. Concerning marriages it is to be observed,

I. When the coats-of-arms of a married couple, descended of distinct families, are to be put together in one escutcheon, the field of their respective arms is conjoined Paleways, and blazoned *parted per pale, Baron and Femme, two coats; first, &c.* In which case the baron's arms are always to be placed on the dexter side, and the femme's arms on the sinister side, as in N° 1 and 2, fig. 23. *Of arms marshalled*, which are,

1. The coat-of-arms of the Rev. Edward Barnard, D. D. chaplain in ordinary to his majesty, provost of Eton-college, canon of Windsor, &c. impaled with that of S. Hagatt, his spouse.

2. The coat-of-arms of the Rev. Thomas Dampier, D. D. chaplain in ordinary to his majesty, prebendary of Durham, canon of Windsor, &c. impaled with that of F. Walker, his spouse.

Marshal-ling. If a widower marry again, his late and present wife's arms are, according to G. Leigh, "to be both placed on the sinister side, in the escutcheon with his own, and parted per Pale. The first wife's coat shall stand on the Chief, and the second on the Base; or he may set them both in Pale with his own, the first wife's coat next to himself, and his second outermost. If he should marry a third wife, then the two first matches shall stand on the Chief, and the third shall have the whole Base. And if he take a fourth wife, she must participate one half of the Base with the third wife, and so will they seem to be so many coats quartered." But it must be observed, that these forms of impaling are meant of hereditary coats, whereby the husband stands in expectation of having the hereditary possessions of his wife united to his patrimony.

II. In the arms of femmes joined to the paternal coat of the baron, the proper differences by which they were borne by the fathers of such women must be inserted.

III. If a coat-of-arms that has a Bordure be impaled with another, as by marriage, then the Bordure must be wholly omitted in the side of the arms next the centre.

IV. The person that marries an heiress, instead of impaling his arms with those of his wife, is to bear them in an escutcheon placed in the centre of his shield, after the same manner as the baronet's badge is marshalled in N° 3. and which, on account of its showing forth his pretension to her estate, is called *an escutcheon of pretence*, and is blazoned *surtout*, i. e. *over-all*, as in the escutcheon borne in the fourth quarter of the royal atchievement. But the children are to bear the hereditary coat-of-arms of their father and mother *quarterly*, which denotes a fixed inheritance, and so transmit them to posterity. The first and fourth quarters generally contain the father's arms, and the second and third the mother's; except the heirs should derive not only their estate, but also their title and dignity, from their mother.

V. If a maiden or dowager lady of quality marry a commoner, or a nobleman inferior to her rank, their coats-of-arms may be set aside of one another in two separate escutcheons, upon one mantle or drapery, and the lady's arms ornamented according to her title; see N° 4, and 6, which represent the coats-of-arms of Gen. C. Montagu, and Lady Elizabeth Villiers Viscountess Grandison.

VI. Archbishops and bishops impale the arms differently from the fore-mentioned coats, in giving the place of honour, that is, the dexter side, to the arms of their dignity, as it is expressed in N° 6. which represents the coat-of-arms of Dr Philip Yonge, Lord bishop of Norwich. It may be observed of the above prelates, that they thus bear their arms parted per Pale, to denote their being joined to their cathedral church in a sort of spiritual marriage.

With respect to such armorial ensigns as the sovereign thinks fit to augment a coat-of-arms with, they may be marshalled various ways, as may be seen by the arms of his grace the duke of Rutland, inserted in fig. 8.

Of Escutcheons.

fig. 8. N° 19. and the example contained in fig. 11. N° 11.

To thofe augmentations may be added, 1ft, The baronet's mark of diftinction, or the arms of the province of Ulfter in Ireland, granted and made hereditary in the male line by King James I. who erected this dignity on the 22d of May 1611, in the 9th year of his reign, in order to propagate a plantation in the fore-mentioned province. This mark is *Argent, a finifter Hand couped at the Wrift, and erected Gules;* which may be borne either in a canton, or in an efcutcheon, as will beft fuit the figures of the arms. See fig. 23. N° 3. which reprefents the coat-of-arms of Sir William Lorrayne, of Kirk-harle, Northumberland, and are thus blazoned: *Quarterly, Sable and Argent, a plain Crofs counter-quartered of the Field.* The Creft,—*A Laurel-tree couped, two branches fprouting out proper, and fixed to the lower part thereof with a Belt Gules, edged and buckled Or.* This, according to tradition in the family, was granted for fome worthy action in the field.

2dly, The ancient and refpectable badge of the moft noble order of the Garter, inftituted by King Edward III. 1349, in the 27th year of his reign; and which, ever fince its inftitution, has been looked upon as a great honour beftowed on the nobleft perfons of this nation and other countries. This honourable augmentation is made to furround, as with a garter, the arms of fuch knights, and is infcribed with this motto, *Honi foit qui mal y penfe:* fee N° 7. which reprefents the coat-of-arms of his grace the duke of Montagu, earl of Cardigan, Baron Brundenel of Stanton-Wevil, conftable and lieutenant of Windfor-caftle, knight of the moft noble order of the Garter, and baronet, prefident of St Luke's Hofpital, and F. R. S.

This nobleman, whofe arms were *Argent, a Cheveron Gules between three Morions proper*, has, fince the deceafe of John duke of Montagu, taken the name and arms of *Montagu*, on account of his being married to Lady Mary Montagu, youngeft daughter and one of the co-heireffes of his grace.

So far the caufes for marfhalling divers arms in one fhield, &c. are *manifeft.* As to fuch as are called *obfcure*, that is, when coats-of-arms are marfhalled in fuch a manner, that no probable reafon can be given why they are fo conjoined, they muft be left to heralds to explain, as being the propereft perfons to unfold thefe and other myfteries of this fcience.

Chap. VII. *Of Funeral Efcutcheons.*

After having treated of the effential parts of the coats-of-arms, of the various charges and ornaments ufually borne therewith, of their attributes and difpofitions, and of the rules for blazoning and marfhalling them, we fhall next defcribe the feveral funeral efcutcheons, ufually called *hatchments;* whereby may be known, after any perfon's deceafe, what rank either he or fhe held when living; and if it be a gentleman's hatchment, whether he was a bachelor, married man, or widower, with the like diftinctions for gentlewomen.

Plate CCLX. The hatchment, fig. 24. N° 1. reprefents fuch as are affixed to the fronts of houfes, when any of the nobility and gentry dies; the arms therein being thofe of a private gentleman and his wife parted per pale; the dexter fide, which is Gules, three Bars Or, for the hufband; having the ground without the efcutcheon black, denotes the man to be dead; and the ground on the finifter fide being white, fignifies that the wife is living, which is alfo demonftrated by the fmall hatchment, N° 2. which is here depicted without mantling, helmet, and creft, for perfpicuity's fake only.

When a married gentlewoman dies firft, the hatchment is diftinguifhed by a contrary colour from the former; that is, the arms on the finifter fide have the ground without the efcutcheon black; whereas thofe on the dexter fide, for her furviving hufband, are upon a white ground: the hatchment of a gentlewoman is, moreover, differenced by a cherub over the arms inftead of a creft. See N° 3.

When a bachelor dies, his arms may be depicted fingle or quartered, with a creft over them, but never impaled as the two firft are, and all the ground without the efcutcheon is alfo black. See N° 4.

When a maid dies, her arms, which are placed in a lozenge, may be fingle or quartered, as thofe of a bachelor; but, inftead of a creft, have a cherub over them, and all the ground without the efcutcheon is alfo black. See N° 5.

When a widower dies, his arms are reprefented impaled with thofe of his deceafed wife, having a helmet, mantling, and creft over them, and all the ground without the efcutcheon black. See N° 6.

When a widow dies, her arms are alfo reprefented impaled with thofe of her deceafed hufband, but enclofed in a lozenge, and, inftead of a creft, a cherub is placed over them; all the ground without the efcutcheon is alfo black. See N° 7.

If a widower or bachelor fhould happen to be the laft of his family, the hatchment is depicted as in N° 6. and that of a maid or widow, whofe family is extinct by her death, is depicted as in N° 7. with this difference only, that a death-head is generally annexed to each hatchment, to denote, that death has conquered all.

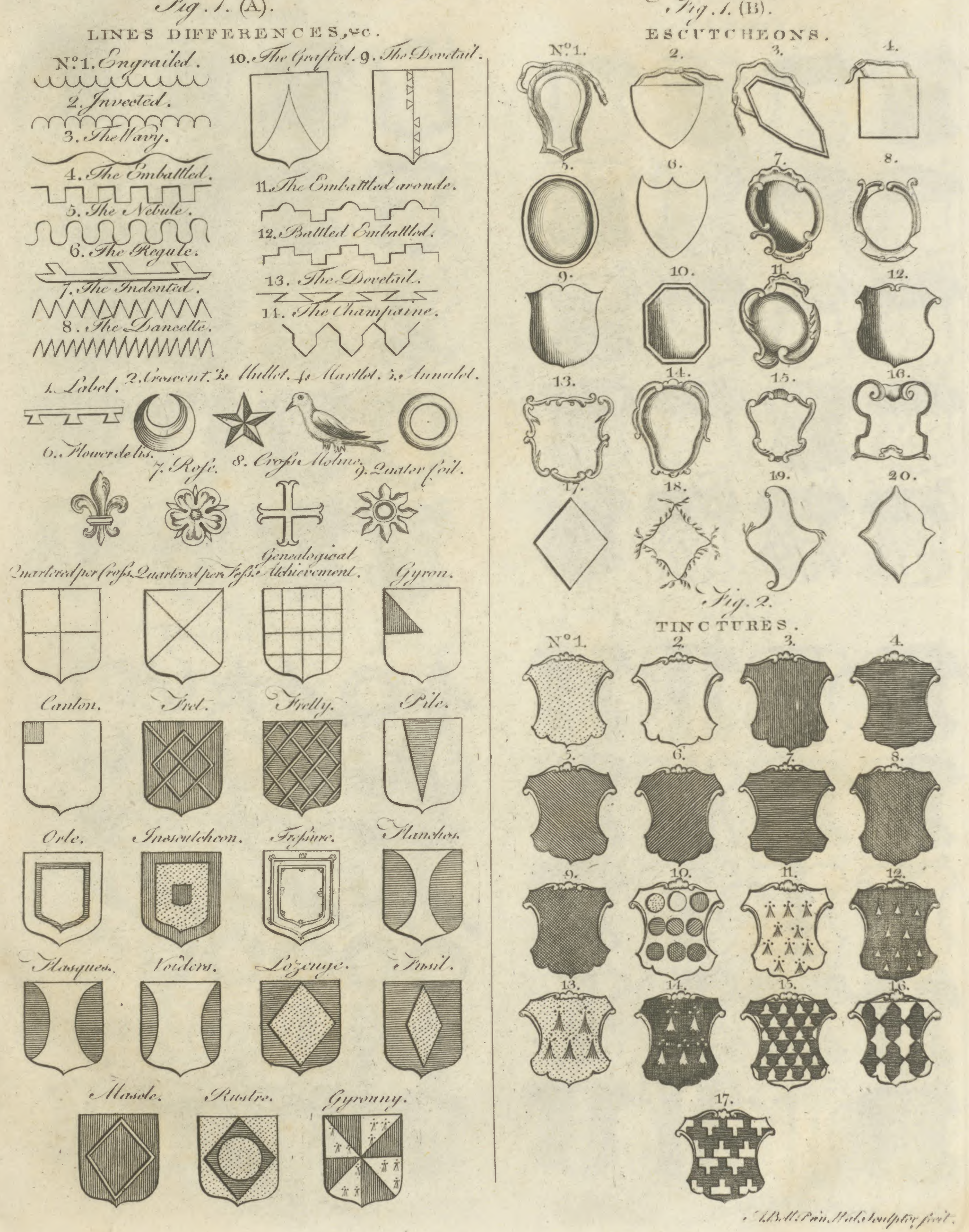
By the fore-mentioned rules, which are fometimes neglected through the ignorance of illiterate people, may be known, upon the fight of any hatchment, what branch of the family is dead; and by the helmet or coronet, what title and degree the deceafed perfon was of.

The fame rules are obferved with refpect to the efcutcheons placed on the hearfe and horfes ufed in pompous funerals, except that they are not furmounted with any creft, as in the foregoing examples of hatchments, but are always plain. It is neceffary, however, to enfign thofe of peers with coronets, and that of a maiden lady with a knot of ribbands.

In *Scotland*, a funeral efcutcheon not only fhows forth the arms and condition of the defunct, but is alfo a proof of the gentility of his defcent; and fuch perfons for whom this fpecies of efcutcheon can be made out, are legally entitled to the character of gentlemen of blood, which is the higheft fpecies of gentility. The Englifh hatchment above defcribed exhibits no more than a right to a coat-of-arms which may be acquired by purchafe, and is only the firft ftep towards eftablifhing gentility in a family.

The

HERALDRY. Plate CCLIV.



HERALDRY

Plate CCLV.

Fig. 3.

BORDURES

Fig. 4.

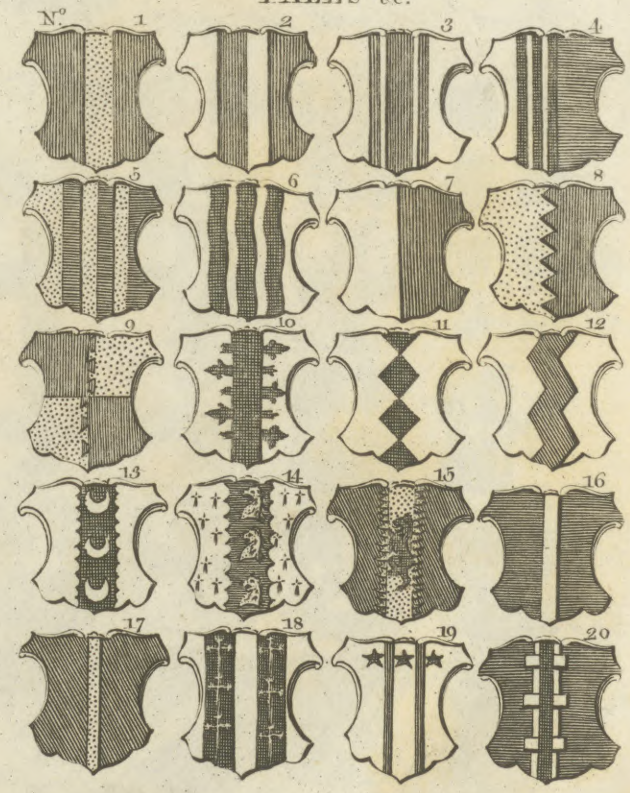
TABLE of HOUSES

Fig. 5.

CHIEFS &c.

Fig. 6.

PALES &c.



A. Bell Prin. Wal. Sculptor fecit.

Fig. 7.

BENDS &c.

Fig. 8.

FESSES & BARS.

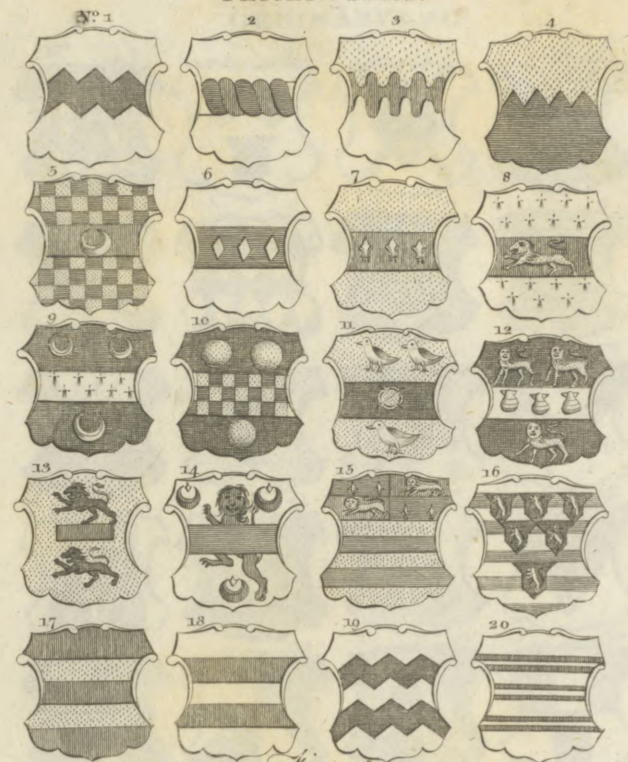
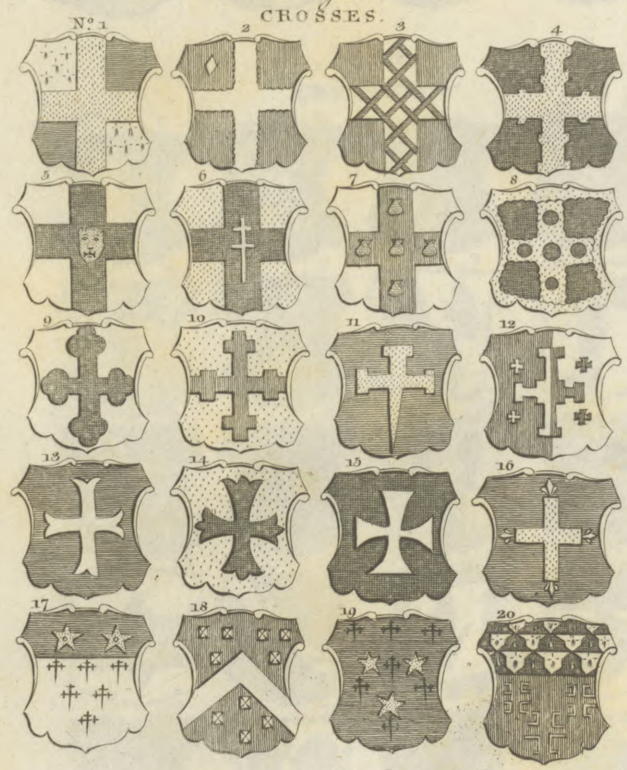


Fig. 9.

CHEVERON &c.

Fig. 10.

CROSSES.



A.Bell Prin. Wal. Sculptor fecit.

Fig. 11.

SALTIERS.

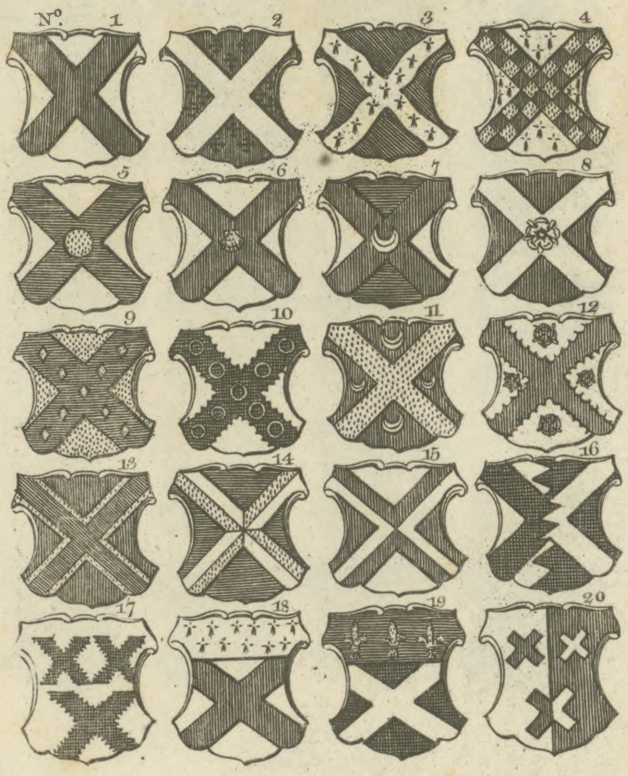


Fig. 12.

ORDINARYS &C.

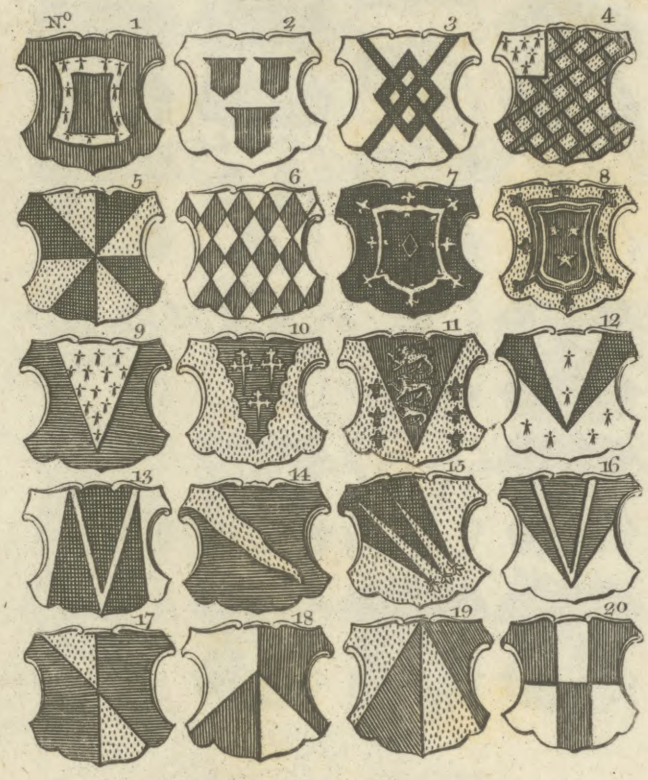


Fig. 13.

CELESTIALS.

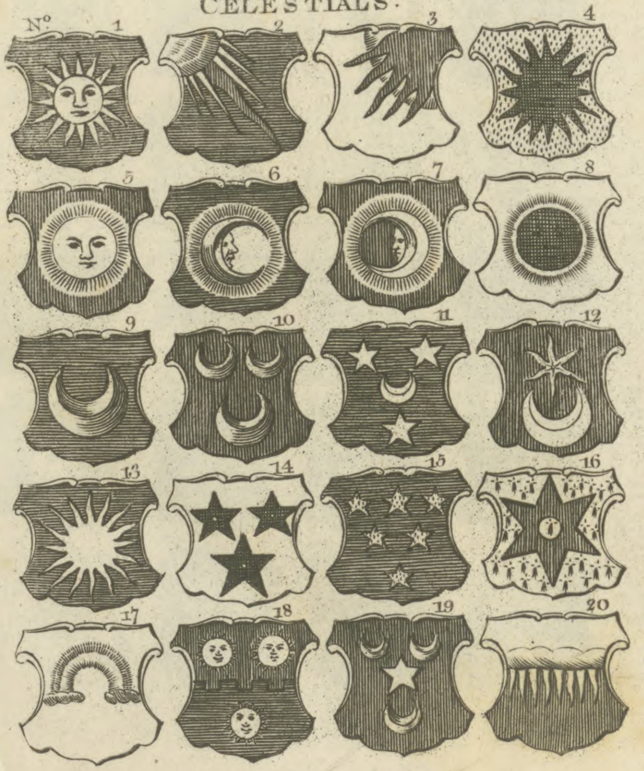


Fig. 14.

EFFIGIES &C.

A. Bell Prin. Wal. Sculptor fecit.

A. Bell Prin. Wal. Sculptor fecit.

Fig. 19.
CHIMERICAL FIGURES.

Fig. 20.
CROWNS.

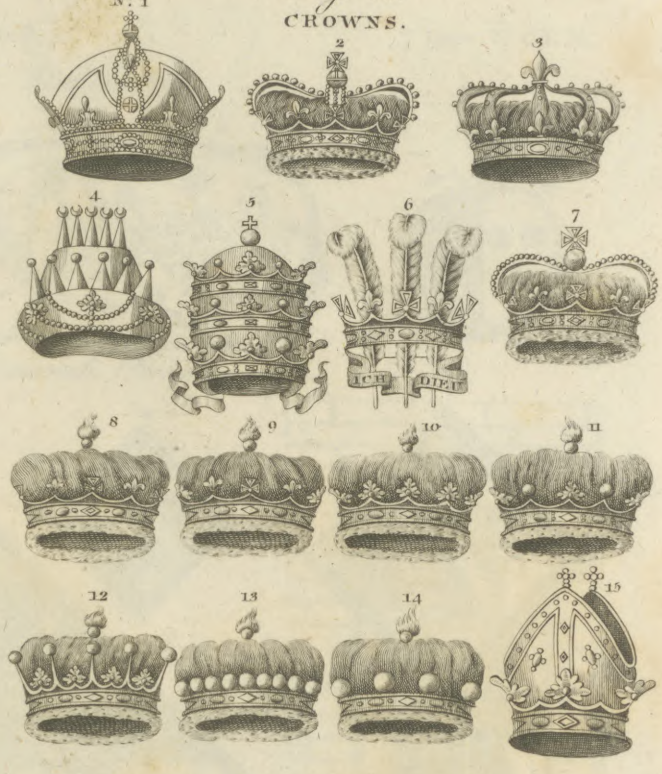
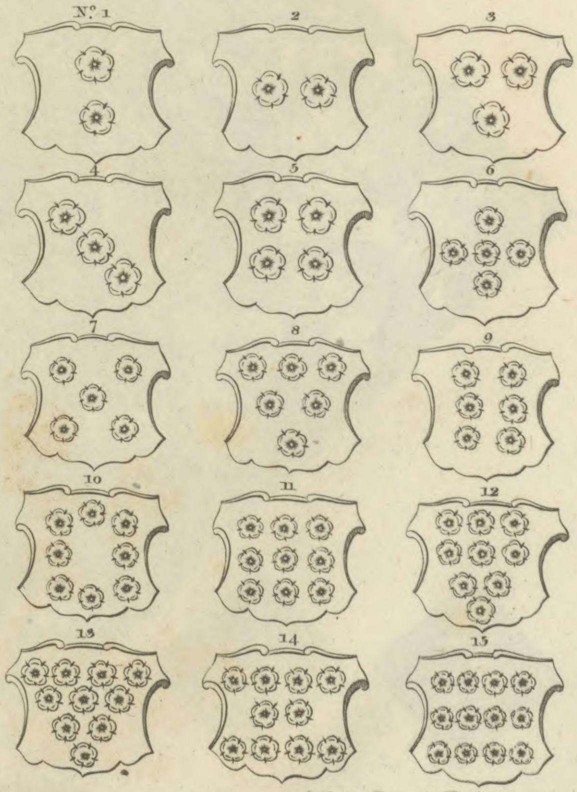


Fig. 21.
ORNAMENTS &c.

Fig. 22.
DISPOSITIONS.



A. Bell Prin. Wal. Sculptor fecit.

Fig. 23. Arms Marshalled.

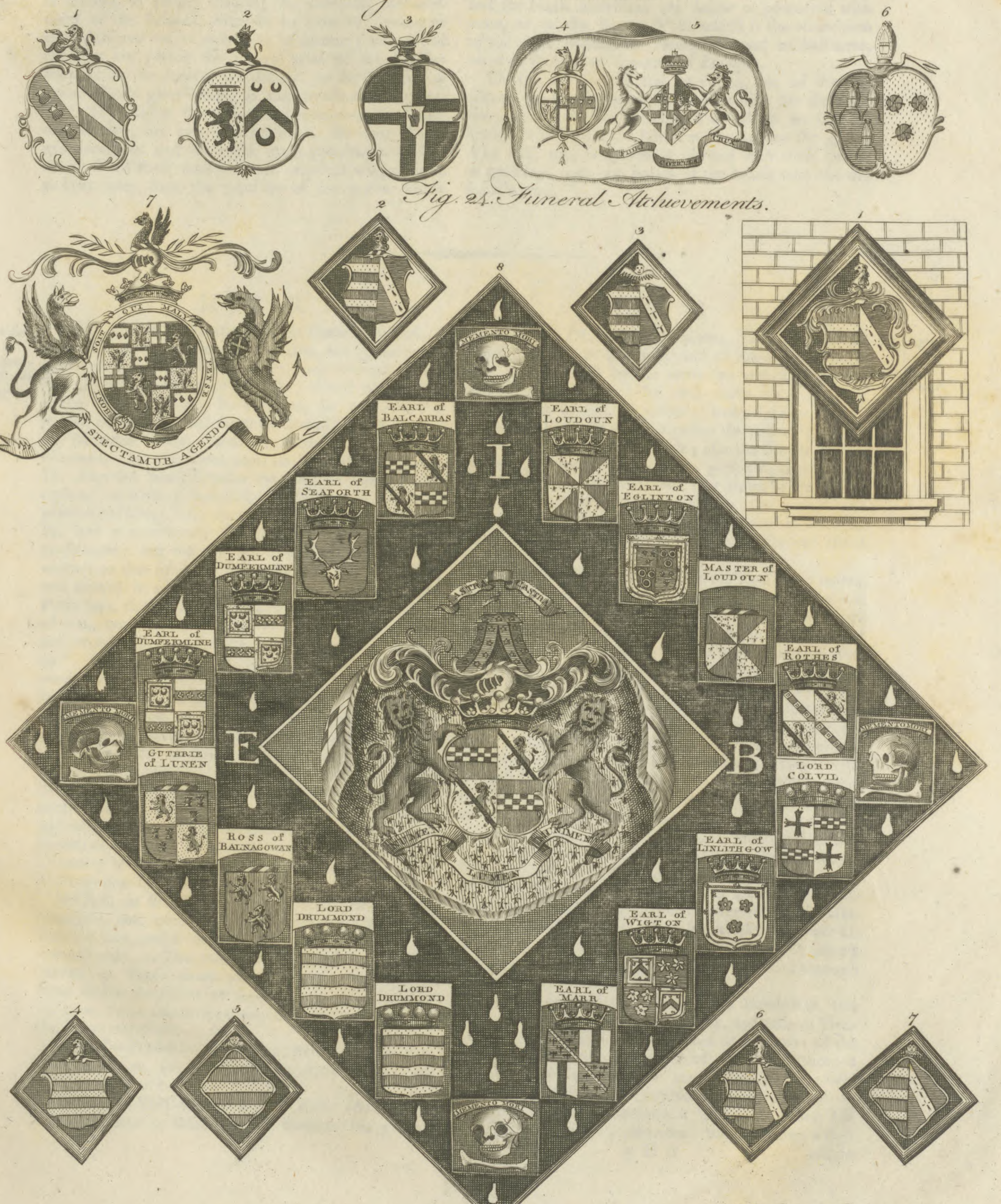


Fig. 24. Funeral Atchievements.

A. Bell Prin. Wal. Sculptor fecit.

Of Escutcheons.

The funeral escutcheon, as exhibited in Scotland, France, and Germany, is in form of a lozenge, above six feet square, of black cloth; in the centre of which is painted, in proper colours, the complete atchievement of the defunct, with all its exterior ornaments and additional marks or badges of honour; and round the sides are placed the sixteen arms of the families from which he derives his descent, as far back as the grandfather's grandfather, as the proofs of his gentility: they exhibit the armorial bearings of his father and mother, his two grandmothers, his four great-grandmothers, and his eight great-grandmothers mothers; if all these families have acquired a legal right to bear arms, then the gentility of the person whose proof it is must be accounted complete, but not otherwise. On the four corners are placed mort-heads, and the initials of his name and titles or designation; and the black interstices are semée or powdered with tears, as in the figure, N° 8. which is the escutcheon of the right honourable James 5th earl of Balcarras, chief of the ancient surname of *Lindesay*.

On the morning of the interment, one of these is placed on the front of the house where the deceased lies; and another on the church in which he is to be buried, which after the burial is fixed above the grave. The pall, too, is generally adorned with these proofs of gentility, and the horses of the hearse with the defunct's arms.

Heraldus || Herbaceous Plants.

HERALDUS, Desiderius, in French *Herault*, a counsellor of the parliament of Paris, has given good proofs of uncommon learning by very different works. His *Adversaria* appeared in 1599; which little book, if the *Scaligerana* may be credited, he repented the having published. His notes on Tertullian's Apology, on Minutius Felix, and on Arnobius, have been esteemed. He also wrote notes on Martial's Epigrams. He disguised himself under the name of *David Leidhresserus*, to write a political dissertation on the independence of kings, some time after the death of Henry IV. He had a controversy with Salmasius, *De jure Attico ac Romano*; but did not live to finish what he had written on that subject. What he had done, however, was printed in 1650. He died in June 1649. Guy Patin says, that "he was looked upon as a very learned man, both in the civil law and in polite literature, and wrote with great facility on any subject he pitched on." Gaille, speaking of such Protestant writers as condemned the executing of Charles I. king of England, quotes the *Pacifique Royal en deuil*, by Herault. This author, son to our Desiderius Heraldus, was a minister in Normandy, when he was called to the service of the Walloon-church of London under Charles I. and he was so zealous a royalist, that he was forced to fly to France, to escape the fury of the commonwealth-men. He returned to England after the Restoration, and resumed his ancient employment in the Walloon-church at London; some time after which he obtained a canonry in the cathedral of Canterbury, and enjoyed it till his death.

HERB, in *Botany*, a name by which Linnæus denominates that portion of every vegetable which arises from the root, and is terminated by the fructification. It comprehends, 1. The trunk, stalk, or stem. 2. The leaves. 3. Those minute external parts called by the same author the *fulcra* or supports of plants. 4. The buds, or, as he also terms them, the *winter-quarters* of the future vegetable.

Herb-Christopher. See Actea, Botany *Index*.

Herb-Robert, (a species of Geranium). See Geranium, Botany *Index*.

HERBACEOUS plants, are those which have succulent stems or stalks that die down to the ground every year. Of herbaceous plants, those are annual which perish stem and root and all every year; biennial, which subsist by the roots two years; perennial which are perpetuated by their roots for a series of years, a new stem being produced every spring.

Herbage || Herbert.

HERBAGE, in *Law*, signifies the pasture provided by nature for the food of cattle; also the liberty to feed cattle in the forest, or in another person's ground.

HERBAL, signifies a book that treats of the classes, genera, species, and virtues of plants.

Herbal, is sometimes also used for what is sometimes called *hortus siccus*, or a collection of dried plants.

HEBBELOL, Bartholemew d', a French writer, eminent for his oriental learning, was born at Paris in 1625. He travelled several times into Italy, where he obtained the esteem of some of the most learned men of the age. Ferdinand II. grand duke of Tuscany, gave him many marks of his favour; a library being exposed to sale at Florence, the duke desired him to examine the manuscripts in the oriental languages, to select the best of them, and to mark the price; which being done, that generous prince purchased them, and made him a present of them. M. Colbert being at length informed of Herbelot's merit, recalled him to Paris, and obtained a pension for him of 1500 livres: he afterwards became secretary and interpreter of the oriental languages, and royal professor of the Syriac tongue. He died at Paris in 1695. His principal work is entitled *Bibliotheque Orientale*, which he first wrote in Arabic, and afterwards translated into French. It is greatly esteemed. M. Herbelot's modesty was equal to his erudition; and his uncommon abilities were accompanied with the utmost probity, piety, and charity, which he practised through the whole course of his life.

HERBERT, Mary, countess of Pembroke, was sister of the famous Sir Philip Sidney, and wife of Henry earl of Pembroke. She was not only a lover of the muses, but a great encourager of polite literature; a character not very common among ladies. Her brother dedicated his incomparable romance *Arcadia* to her, from which circumstance it hath been called *The Countess of Pembroke's Arcadia*. She translated a dramatic piece from the French, entitled *Antonius*, a tragedy; though it is said she was assisted by her lord's chaplain, Dr Babington, afterwards bishop of Exeter. She also turned the Psalms of David into English metre; but it is doubtful whether these works were ever printed. She died in 1621; and an exalted character of her is to be found in Francis Osborne's memoirs of King James I.

Herbert, *Edward*, Lord Herbert of Cherbury in Shropshire, an eminent English writer, was born in 1581, and educated at Oxford; after which he travelled, and at his return was made knight of the Bath. James I. sent him ambassador to Louis XIII. in behalf of the Protestants who were besieged in several cities of France; and continued in this station till he was recalled, on account of a dispute between him and the constable de Luines. In 1625 he was advanced to the dignity of a baron in the kingdom of Ireland, by the title of Lord Herbert of Castle Island; and in 1631 to that of Lord Herbert of Cherbury in Shropshire. After the breaking out of the civil wars, he adhered to the parliament; and in 1644 obtained a pension, on account of his having been plundered by the king's forces. He wrote a History of the Life and Reign of Henry VIII. which was greatly admired; a treatise *De veritate;* and several other works. He died at London in 1648.

"Lord Herbert (says Mr Granger), stands in the first rank of the public ministers, historians, and philosophers of his age. It is hard to say whether his person, his understanding, or his courage, was the most extraordinary; as the fair, the learned, and the brave, held him in equal admiration. But the same man was wise and capricious; redressed wrongs, and quarrelled for punctilios; hated bigotry in religion, and was himself a bigot to philosophy. He exposed himself to such dangers as other men of courage would have carefully declined: and called in question the fundamentals of a religion which none had the hardiness to dispute besides himself.

Herbert, *William*, earl of Pembroke, was born at Wilton in Wiltshire, 1580; and admitted to New-college in Oxford in 1592, where he continued about two years. In 1601 he succeeded to his father's honours and estate; was made K. G. in 1604; and governor of Portsmouth six years after. In 1626 he was elected chancellor of the university of Oxford; and about the same time made lord steward of the king's household. He died suddenly at his house called *Baynard's castle*, in London, April 10. 1630; according to the calculation of his nativity, says Wood, made several years before by Mr Thomas Allen of Gloucester-hall. Clarendon relates concerning this calculation, that some considerable persons connected with Lord Pembroke being met at Maidenhead, one of them at supper drank a health to the lord steward; upon which another said, that he believed his lordship was at that time very merry; for he had now outlived the day, which it had been prognosticated upon his nativity he would not outlive; but he had outlived it now, for that was his birth-day, which had completed his age to 50 years. The next morning, however, they received the news of his death. Whether the noble historian really believed this and other accounts relating to astrology, apparitions, providential interpositions, &c. which he has inserted in his history, we do not presume to say: he delivers them, however, as if he did not actually disbelieve them. Lord Pembroke was not only a great favourer of learned and ingenious men, but was himself learned, and endued with a considerable share of poetic genius. All that are extant of his productions in this way were published with this title: "Poems written by William earl of Pembroke, &c. many of which are answered by way of repartee by Sir Benjamin Rudyard, with other poems written by them occasionally and apart, 1660, 8vo.

Herbert, *Sir Thomas*, an eminent gentleman of the Pembroke family, was born at York, where his father was an alderman. William earl of Pembroke sent him to travel at his expence in 1626, and he spent four years in visiting Asia and Africa: his expectations of preferment ending with the death of the earl, he went abroad again, and travelled over several parts of Europe. In 1634, he published, in folio, A Relation of some Years Travel into Africa and the Great Asia, especially the Territories of the Persian monarchy, and some parts of the Oriental Indies and isles adjacent. On the breaking out of the civil war, he adhered to the parliament; and at Oldenby, on the removal of the king's servants, by desire of the commissioners from the parliament, he and James Harrington were retained as grooms of his bed-chamber, and attended him even to the block. At the restoration he was created a baronet by Charles II. for his faithful services to his father during his two last years. In 1678 he wrote *Threnodia Carolina*, containing an account of the two last years of the life of Charles I. and he assisted Sir William Dugdale in compiling the third volume of his *Monasticon Anglicanum*. He died at York in 1682, leaving several MSS. to the public library at Oxford, and others to that of the cathedral at York.

HERBIVOROUS animals, those which feed only on vegetables.

HERCULANEUM is the name of an ancient city of Campania in Italy, which was destroyed by an eruption of Vesuvius in the first year of the emperor Titus, or the 79th of the Christian era, and lately rendered famous on account of the curious monuments of antiquity discovered in its ruins; an account of which has been published by order of the king of Naples, in a work of six volumes folio.—The epocha of the foundation of Herculaneum is unknown. Dionysius Halicarnassensis conjectures that it may be referred to 60 years before the war of Troy, or about 1342 years before Christ; and therefore that it lasted about 1400 years.

The thickness of the heap of lava and ashes by which the city was overwhelmed, has been much increased by fiery streams vomited since that catastrophe; and now forms a mass 24 feet deep, of dark gray stone, which is easily broken to pieces. By its non-adhesion to foreign bodies, marbles and bronzes are preserved in it as in a case made to fit them; and exact moulds of the faces and limbs of statues are frequently found in this substance. The precise situation of this subterraneous city was not known till the year 1713, when, it was accidentally discovered by some labourers, who, in digging a well, struck upon a statue on the benches of the theatre. Many others were afterwards dug out and sent to France by the prince of Elbœuf.

Herculaneum.

But little progreſs was made in the excavations till Charles infant of Spain aſcended the Neapolitan throne; by whoſe unwearied efforts and liberality a very conſiderable part of Herculaneum has been explored, and ſuch treaſures of antiquity drawn out as form the moſt curious muſeum in the world. It being too arduous a taſk to attempt removing the covering, the king contented himſelf with cutting galleries to the principal buildings, and cauſing the extent of one or two of them to be cleared. Of theſe the theatre is the moſt conſiderable. On a balluſtrade which divided the orcheſtra from the ſtage was found a row of ſtatues; and, on each ſide of the pulpitum, the equeſtrian figure of a perſon of the Nonia family. They are now placed under porticoes of the palace; and from the great rarity of equeſtrian ſtatues in marble would be very valuable objects, were their workmanſhip even leſs excellent than it is: one of them in particular is a very fine piece of ſculpture. Since the king of Spain left Naples, the digging has been continued, but with leſs ſpirit and expenditure: indeed the collection of curioſities brought out of Herculaneum and Pompeii is already ſo conſiderable, that a relaxation of zeal and activity becomes excuſable. They are now arranged in a wing of the palace; and conſiſt not only of ſtatues, buſts, altars, inſcriptions, and other ornamental appendages of opulence and luxury; but alſo comprehend an entire aſſortment of the domeſtic, muſical, and chirurgical inſtruments uſed by the ancients; tripods of elegant form and exquiſite execution, lamps in endleſs variety, vaſes and baſons of noble dimenſions, chandeliers of the moſt beautiful ſhapes, pateras and other appurtenances of ſacrifice, looking-glaſſes of poliſhed metal, coloured glaſs, ſo hard, clear, and well ſtained, as to appear emeralds, ſapphires, and other precious ſtones; a kitchen completely fitted up with copper-pans lined with ſilver, kettles, ciſterns for heating water, and every utenſil neceſſary for culinary purpoſes; ſpecimens of various ſorts of combuſtibles, retaining their form though burnt to a cinder; corn, bread, fiſh, oil, wine, and flour; a lady's toilet, fully furniſhed with combs, thimbles, rings, paint, earrings, &c. Among the ſtatues, which are numerous, connoiſſeurs allow the greateſt ſhare of merit to a Mercury and a ſleeping faun: the buſts fill ſeveral rooms; but very few of the originals whom they were meant to imitate are known. The floors are paved with ancient moſaic. Few rare medals have been found in theſe ruins; the moſt curious is a gold medallion of Auguſtus ſtruck in Sicily in the 15th year of his reign. The freſco paintings, which, for the ſake of preſervation, have been torn off the walls and framed and glazed, are to be ſeen in another part of the palace. "The elegance of the attitudes, and the infinite variety of the ſubjects (Mr Swinburne obſerves), ſtamp them as performances worthy of the attention of artiſts and antiquarians; but no pictures yet found are maſterly enough to prove that the Greeks carried the art of painting to as great a height of perfection as they did that of ſtatuary. Yet can we ſuppoſe thoſe authors incapable of appreciating the merits of an Apelles or a Zeuxis, who with ſo much critical diſcernment have pointed out the beauties of the works of a Phidias or a Praxiteles, beauties that we have ſtill an opportunity of contemplating? would they have beſtowed equal praiſes upon both kinds of performances if either of them had been much inferior to the other? I think it is not probable; and we muſt preſume, that the capital productions of the ancient painters, being of more periſhable materials than buſts and ſtatues, have been deſtroyed in the fatal diſaſters that have ſo often afflicted both Greece and Italy. Herculaneum and Pompeii were but towns of the ſecond order, and not likely to poſſeſs the maſterpieces of the great artiſts, which were uſually deſtined to adorn the more celebrated temples, or the palaces of kings and emperors." A more valuable acquiſition than bronzes and pictures was thought to be made, when a large parcel of manuſcripts was found among the ruins. Hopes were entertained that many works of the claſſics, which time has deprived us of, were now going to be reſtored to light, and that a new mine of ſcience was on the point of being opened. But the difficulty of unrolling the burnt parchment, of paſting the fragments on a flat ſurface, and of deciphering the obſcure letters, have proved ſuch obſtacles, that very little progreſs has been made in the work. A prieſt invented the method of proceeding; but it would require the joint labours of many learned men to carry on ſo nice and tedious an operation with any ſucceſs. The plan is dropped; and the manuſcripts now lie in duſty heaps, as uſeleſs to the learned world as they had been for the preceding ſeventeen centuries.

Hercules.

HERCULES, in fabulous hiſtory, a moſt renowned Grecian hero, who after death was ranked among the gods, and received divine honours. According to the ancients, there were many perſons of the ſame name. Diodorus mentions three, Cicero ſix, and ſome authors extend the number to no leſs than forty-three. Of all theſe, one generally called the *Theban Hercules*, is the moſt celebrated; and to him, as may eaſily be imagined, the actions of the others have been attributed. He is reported to have been the ſon of Jupiter by Alcmena (wife to Amphitryon king of Argos), whom Jupiter enjoyed in the ſhape of her huſband while he was abſent; and in order to add the greater ſtrength to the child, made that amorous night as long as three. Amphitryon having ſoon after accidentally killed his uncle and father-in-law Electryon, was obliged to fly to Thebes, where Hercules was born. The jealouſy of Juno, on account of her huſband's amour with Alcmena, prompted her to deſtroy the infant. For this purpoſe ſhe ſent two ſerpents to kill him in the cradle, but young Hercules ſtrangled them both. He was early inſtructed in the liberal arts, and Caſtor the ſon of Tyndarus taught him how to fight, Eurytus how to ſhoot with a bow and arrows, Autolicus to drive a chariot, Linus to play on the lyre, and Eumolpus to ſing. He, like the reſt of his illuſtrious contemporaries, ſoon after became the pupil of the centaur Chiron, and under him he perfected and rendered himſelf the moſt valiant and accompliſhed of the age. In the 18th year of his age he reſolved to deliver the neighbourhood of Mount Cithæron from a huge lion which preyed on the flocks of Amphitryon his ſuppoſed father, and which laid waſte the adjacent country. He went to the court of Theſpius king of Theſpis, who ſhared in the general calamity; and he received here a tender treatment, and was entertained during 50 days. The 50 daughters of the king became mothers by Hercules during

during his ſtay at Theſpis, and ſome ſay that it was effected in one night. After he had deſtroyed the lion of Mount Cithæron, he delivered his country from the annual tribute of 100 oxen which it paid to Erginus. Such public ſervices became univerſally known; and Creon, who then ſat on the throne of Thebes, rewarded the patriotic deeds of Hercules by giving him his daughter in marriage, and entruſting him with the government of his kingdom.

Euriſtheus, the ſon of Amphitryon, having ſucceeded his father, ſoon became jealous of Hercules; and fearing leſt he might by him be deprived of his crown, left no means untried to get rid of him. Of this Hercules was not inſenſible, becauſe he was perpetually engaging him on ſome deſperate expedition; and therefore went to conſult the oracle. But being anſwered that it was the pleaſure of the gods that he ſhould ſerve Euriſtheus 12 years, he fell into a deep melancholy, which at laſt ended in a furious madneſs; during which, among other deſperate actions, he put away his wife Megara, and murdered all the children he had by her. As an expiation of this crime, the king impoſed upon him twelve labours ſurpaſſing the power of all other mortals to accompliſh, which nevertheleſs our hero performed with great eaſe. The favours of the gods had indeed completely armed him when he undertook his labours. He had received a coat of armour and helmet from Minerva, a ſword from Mercury, a horſe from Neptune, a ſhield from Jupiter, a bow and arrows from Apollo, and from Vulcan a golden cuiraſs and brazen buſkin, with a celebrated club of braſs according to the opinion of ſome writers.

The firſt labour impoſed upon him was the killing of a lion in Nemea, a wood of Achaia; whoſe hide was proof againſt any weapon, ſo that he was forced to ſeize him by the throat and ſtrangle him. He carried the dead beaſt on his ſhoulders to Mycenæ, and ever after clothed himſelf with the ſkin. Euriſtheus was ſo aſtoniſhed at the ſight of this beaſt, and at the courage of Hercules, that he ordered him never to enter the gates of the city when he returned from his expeditions, but to wait for his orders without the walls. He even made himſelf a brazen veſſel into which he retired whenever Hercules returned.—The ſecond labour was to deſtroy the Lernæan hydra, which had ſeven heads according to Apollodorus, 50 according to Simonides, and 100 according to Diodorus. This celebrated monſter he firſt attacked with his arrows; but ſoon after he came to a cloſe engagement, and by means of his heavy club he deſtroyed the heads of his enemy. This, however, was productive of no advantage; for as ſoon as one head was beaten to pieces by the club, immediately two ſprang up; and the labour of Hercules would have remained unfiniſhed, had not he commanded his friend Iolas to burn with a hot iron the root of the head which he had cruſhed to pieces. This ſucceeded; and Hercules became victorious, opened the belly of the monſter, and dipped his arrows in the gall to render the wounds which he gave fatal and incurable.—He was ordered in his third labour to bring alive and unhurt into the preſence of Euriſtheus a ſtag, famous for its incredible ſwiftneſs, its golden horns, and brazen feet. This celebrated animal frequented the neighbourhood of Œnoe; and Hercules was employed for a whole year in continually purſuing it: at laſt he caught it in a trap, or when tired, or, according to others, by ſlightly wounding it and leſſening its ſwiftneſs.—The fourth labour was to bring alive to Euriſtheus a wild boar which ravaged the neighbourhood of Erymanthus. In this expedition he deſtroyed the centaurs, and caught the boar by cloſely purſuing him through the deep ſnow. Euriſtheus was ſo frightened at the ſight of the boar, that, according to Diodorus, he hid himſelf in his brazen veſſel for ſome days.—In his fifth labour Hercules was ordered to clean the ſtables of Augeas, where 3000 oxen had been confined for many years.—For his ſixth labour he was ordered to kill the carnivorous birds which ravaged the country near the lake Stymphalis in Arcadia. —In his ſeventh labour he brought alive into Peloponneſus a prodigious wild bull which laid waſte the iſland of Crete.—In his eighth labour he was employed in obtaining the mares of Diomedes, which fed upon human fleſh. He killed Diomedes, and gave him to be eaten by his mares, which he brought to Euriſtheus. They were ſent to Mount Olympus by the king of Mycenæ, where they were devoured by the wild beaſts; or, according to others, they were conſecrated to Jupiter, and their breed ſtill exiſted in the age of Alexander the Great.—For his ninth labour, he was commanded to obtain the girdle of the queen of the Amazons.—In his tenth labour he killed the monſter Geryon king of Gades, and brought to Argos his numerous flocks which fed upon human fleſh. This was in Iberia or Spain; in the furtheſt parts of which he erected his two pillars, as the utmoſt limits of the then known world. Theſe ten labours he atchieved, as the fable ſays, in about eight years. In this laſt expedition he is likewiſe affirmed to have killed Antæus, a famous giant of a monſtrous ſize, who, when weary with wreſtling or labour, was immediately refreſhed by touching the earth. Hercules overcame him in wreſtling, and ſlew him; and after him the tyrant Buſiris, in his way through Egypt. This bloody man uſed to ſacrifice all his gueſts and ſtrangers upon his altars; and deſigning to have done the ſame by Hercules, was ſlain by him, together with all his attendants.—His eleventh labour was the carrying away the Heſperian golden apples kept by a dragon: (See Hesperides). —The twelfth and laſt, and moſt dangerous of his labours, was to bring upon earth the three-headed dog Cerberus. Deſcending into hell by a cave on Mount Tænarus, he was permitted by Pluto to carry away his friends Theſeus and Pirithous, who were condemned to puniſhment in hell, and Cerberus alſo was granted to his prayers, provided he made uſe of no arms but only force to drag him away. Hercules, as ſome report, carried him back to hell after he had brought him before Euriſtheus.

Many other exploits are ſaid to have been performed by Hercules; in particular, he accompanied the Argonauts to Colchis before he delivered himſelf up to the king of Mycenæ. He aſſiſted the gods in their wars againſt the giants, and it was through him alone that Jupiter obtained a victory. He conquered Laomedon, and pillaged Troy. When Iole, the daughter of Eurytus king of Œchalia, of whom he was deeply enamoured, was refuſed to his intreaties, be became the prey of a ſecond fit of inſanity, and he murdered Iphitus, Hercules

Iphitus, the only one of the ſons of Eurytus who favoured his addreſſes to Iole. He was ſome time after purified of the murder, and his inſanity ceaſed; but the gods perſecuted him, and he was viſited by a diſorder which obliged him to apply to the oracle of Delphi for relief. The coldneſs with which the Pythia received him irritated him, and he reſolved to plunder Apollo's temple and carry away the ſacred tripod. Apollo oppoſed him, and a ſevere conflict was begun, which nothing but the interference of Jupiter with his thunderbolts could have prevented. He was upon this told by the oracle that he muſt be ſold as a ſlave, and remain three years in the moſt abject ſervitude to recover from his diſorder. He complied; and Mercury, by order of Jupiter, conducted him to Omphale, queen of Lydia, to whom he was ſold as a ſlave. Here he cleared all the country from robbers; and Omphale, who was aſtoniſhed at the greatneſs of his exploits, married him. Hercules had Agelaus and Lamon by Omphale, from whom Crœſus king of Lydia was deſcended. He became alſo enamoured of one of Omphale's female ſervants, by whom he had Alceus. After he had completed the years of his ſlavery, he returned to Peloponneſus, where he re-eſtabliſhed on the throne of Sparta Tyndarus, who had been expelled by Hippocoon. He became one of Dejanira's ſuitors, and married her after he had overcome all his rivals. He was obliged to leave Calydon his father-in-law's kingdom, becauſe he had inadvertently killed a man with a blow of his fiſt, and it was on account of this expulſion that he was not preſent at the hunting of the Calydonian boar. From Calydon he retired to the court of Ceyx king of Trachinia. The king received him and his wife with great marks of friendſhip, and purified him of the murder which he had committed at Calydon. Hercules was ſtill mindful that he had once been refuſed the hand of Iole; he therefore made war againſt her father Eurytus, and killed him with three of his ſons. Iole fell into the hands of her father's murderer, and found that ſhe was loved by Hercules as much as before. She accompanied him on Mount Œta, where he was going to raiſe an altar and offer a ſolemn ſacrifice to Jupiter. As he had not then the ſhirt and tunic in which he arrayed himſelf to offer a ſacrifice, he ſent Lichas to Trachin to his wife Dejanira, in order to provide himſelf a proper dreſs. Dejanira had ſome time before been attempted by the Centaur Neſſus, as he was ferrying her over the river Euenus; and Hercules beholding it from the ſhore, had given him a mortal wound with an arrow. The monſter finding himſelf dying, adviſed her to mix ſome oil with the blood which flowed from his wound, and to anoint her huſband's ſhirt with it, pretending that it would infallibly ſecure him from loving any other woman; and ſhe, too well appriſed of his inconſtancy, had actually prepared the poiſoned ointment accordingly.—Lychas coming to her for the garments, unfortunately acquainted her with his having brought away Iole; upon which ſhe, in a fit of jealouſy, anointed his ſhirt with the fatal mixture. This had no ſooner touched his body, than he felt the poiſon diffuſe itſelf through all his veins; the violent pain of which cauſed him to diſband his army, and to return to Trachin. His torment ſtill increaſing, he ſent to conſult the oracle for a cure; and was anſwered, that he ſhould cauſe himſelf to be conveyed to Mount Œta, and there rear up a great pile of wood, and leave the reſt to Jupiter. By the time he had obeyed the oracle, his pains being become intolerable, he dreſſed himſelf in his martial habit, flung himſelf upon the pile, and deſired the byſtanders to ſet fire to it. Others ſay that he left the charge of it to his ſon Philoctetes; who having performed his father's command, had his bow and arrows given him as a reward for his obedience. At the ſame time Jupiter, to be as good as his word, ſent a flaſh of lightning, which conſumed both the pile and the hero; inſomuch that Ioläus, coming to take up his bones, found nothing but aſhes: from which they concluded, that he was paſſed from earth to heaven, and joined to the gods. His friends ſhowed their gratitude to his memory by raiſing an altar where the burning pile had ſtood. Menœtius the ſon of Actor offered him a ſacrifice of a bull, a wild boar, and a goat, and enjoined the people of Opus yearly to obſerve the ſame religious ceremonies. His worſhip ſoon became as univerſal as his fame; and Juno, who had once perſecuted him with ſuch fury forgot her reſentment, and gave him her daughter Hebe in marriage. Hercules has received many ſurnames and epithets, either from the place where his worſhip was eſtabliſhed, or from the labours which he atchieved. His temples were numerous and magnificent, and his divinity revered. No dogs or flies ever entered his temple at Rome; and that of Gades, according to Strabo, was always forbidden to women and pigs. The Phœnicians offered quails on his altars; and as it was ſuppoſed that he preſided over dreams, the ſick and infirm were ſent to ſleep in his temples, that they might receive in their dreams the agreeable preſages of their approaching recovery. The white poplar was particularly dedicated to his ſervice.

It is obſerved, that there are none even of the twelve great gods of antiquity that have ſo many ancient monuments relating to them as Hercules. The famous ſtatue of Hercules, in the Farneſe palace at Rome, is well known to the connoiſſeurs: this repreſents him reſting after the laſt of his twelve labours above recited, leaning on his club, and holding the apples of the Heſperides in his hand. In this ſtatue, as in all the other figures of him, he is formed, by the breadth of his ſhoulders, the ſpaciouſneſs of his cheſt, the largeneſs of his ſize, and the firmneſs of his muſcles, to expreſs ſtrength and a capacity of enduring great fatigue, which conſtituted the chief idea of virtue among the ancient heathens. His other attributes are his lion's ſkin, his club, and his bow.—Hercules is repreſented by the ancients as an exemplar of virtue: however, the *Hercules Bibax*, or drunken Hercules, is no uncommon figure; and his amours are deſcribed both by the poets and artiſts. Thus, the Cupids are made to take away his club, and he is exhibited in the poſture of bending under a little boy; by which actions we perceive, that he who conquered all difficulties was a ſlave to love. His children are as numerous as the labours and difficulties which he underwent; and indeed they became ſo powerful ſoon after his death, that they alone had the courage to invade all Peloponneſus. See HERACLIDÆ.

The

Hercules ‖ Hereditary Right.

The apotheosis of Hercules, or the establishment of his altars in the principal cities of Greece, is fixed by Thrasybulus 29 years before the taking of Troy.

Hercules has been particularly honoured by the Greeks under the name of *Musagetes*, "the conductor of the Muses;" and at Rome under that of *Hercules Musarum*. He is represented on medals with a lyre in his hand; and the reverse is marked with the figure of the nine Muses, with their proper symbols.

Hercules, in *Astronomy*, one of the constellations of the northern hemisphere.—The stars in the constellation Hercules in Ptolemy's catalogue are 29; in Tycho's, 28; in the Britannic catalogue, 113.

Hercules's Pillars, in antiquity, a name given to two lofty mountains, situated one on the most southern extremity of Spain, and the other on the opposite part of Africa. They were called by the ancients *Abyla* and *Calpe*. They are reckoned the boundaries of the labours of Hercules; and according to ancient tradition, they were joined together till they were severed by the arm of the hero, and a communication opened between the Mediterranean and Atlantic seas.

HERCYNIA silva, in *Ancient Geography*, the largest of forests. Its breadth was a journey of nine days to the best traveller. Taking its rise at the limits of the Helvetii, Nemetes, and Rauraci, it run along the Danube to the borders of the Daci and Anartes, a length of 60 days journey, according to Cæsar, who appears, to have been well acquainted with its true breadth, seeing it occupied all Lower Germany. It may therefore be considered as covering the whole of Germany; and most of the other forests may be considered as parts of it, though distinguished by particular names: consequently the Hartz, in the duchy of Brunswic, which gave name to the whole, may be considered as one of its parts. The name *Hartz* denotes "resinous," or, "pine-trees." By the Greeks it is called *Orcynius*, as a name common to all the forests in Germany; in the same manner as *Hercynius* was the name given by the Romans; and both from the German *Hartz*.

HERD, among hunters, an assemblage of black or fallow beasts in contradistinction to *flock*. See Flock.—In the hunting language there are various terms used for companies of the divers kinds of game. We say a *herd* of harts or bucks, a *bevy* of roes, a *rout* of wolves, a *richess* of martens, &c.

HEREDITAMENTS, whatever moveable things a person may have to himself and his heirs by way of inheritance; and which, if not otherwise bequeathed, descend to him who is next heir, and not to the executor as chattels do.

HEREDITARY, an appellation given to whatever belongs to a family by right of succession from heir to heir.

Hereditary is also figuratively applied to good or ill qualities supposed to be transmitted from father to son: thus we say virtue and piety are hereditary qualities in such a family; and that in Italy the hatred of families is hereditary. And indeed the gout, king's evil, madness, &c. may really be hereditary diseases.

Hereditary Right, in the British constitution. The grand fundamental maxim upon which the *jus coronæ*, or right of succession to the throne of Britain depends, Sir William Blackstone takes to be this: That the crown is, by common law and constitutional custom, hereditary; and this in a manner peculiar to itself: but that the right of inheritance may from time to time be changed or limited by act of parliament; under which limitations the crown still continues hereditary.

1. The crown is in general hereditary, or descendible to the next heir, on the death or demise of the last proprietor. All regal governments must be either hereditary or elective: and as there is no instance wherein the crown of England has ever been asserted to be elective, except by the regicides at the infamous and unparalleled trial of King Charles I.; it must of consequence be hereditary. Yet in thus asserting an hereditary right, a *jure divino* title to the throne is by no means intended. Such a title may be allowed to have subsisted under the theocratic establishments of the children of Israel in Palestine; but it never yet subsisted in any other country; save only so far as kingdoms, like other human fabrics, are subject to the general and ordinary dispensations of Providence. Nor indeed have a *jure divino* and an hereditary right any necessary connection with each other; as some have very weakly imagined. The titles of David and Jehu were equally *jure divino* as those of either Solomon or Ahab; and yet David slew the sons of his predecessor, and Jehu his predecessor himself. And when our kings have the same warrant as they had, whether it be to sit upon the throne of their fathers, or to destroy the house of the preceding sovereign, they will then, and not before, possess the crown of England by a right like theirs, immediately derived from heaven. The hereditary right, which the laws of England acknowledge, owes its origin to the founders of our constitution, and to them only. It has no relation to, nor depends upon, the civil laws of the Jews, the Greeks, the Romans, or any other nation upon earth; the municipal laws of one society having no connection with, or influence upon, the fundamental polity of another. The founders of our English monarchy might perhaps, if they had thought proper, have made it an elective monarchy; but they rather chose, and upon good reason, to establish originally a succession by inheritance. This has been acquiesced in by general consent, and ripened by degrees into common law; the very same title that every private man has to his own estate. Lands are not naturally descendible, any more than thrones: but the law has thought proper, for the benefit and peace of the public, to establish hereditary succession in the one as well as the other.

It must be owned, an elective monarchy seems to be the most obvious, and best suited of any to the rational principles of government, and the freedom of human nature; and accordingly we find from history, that, in the infancy and first rudiments of almost every state, the leader, chief magistrate, or prince, hath usually been elective. And, if the individuals who compose that state could always continue true to first principles, uninfluenced by passion or prejudice, unassailed by corruption, and unawed by violence, elective succession were as much to be desired in a kingdom as in other inferior communities. The best, the wisest, and the bravest man, would then be sure of receiving that crown which his endowments have merited; and the sense of an unbiassed majority would be dutifully acquiesced in by the few who were of different opinions. But history and observation will inform us, that elections of every kind

Hereditary.

kind (in the preſent ſtate of human nature) are too frequently brought about by influence, partiality, and artifice: and, even where the caſe is otherwiſe, theſe practices will be often ſuſpected, and as conſtantly charged upon the ſucceſsful, by a ſplenetic diſappointed minority. This is an evil to which all ſocieties are liable; as well thoſe of a private and domeſtic kind, as the great community of the public, which regulates and includes the reſt. But in the former there is this advantage, That ſuch ſuſpicions, if falſe, proceed no farther than jealouſies and murmurs, which time will effectually ſuppreſs; and, if true, the injuſtice may be remedied by legal means, by an appeal to thoſe tribunals to which every member of ſociety has (by becoming ſuch) virtually engaged to ſubmit. Whereas, in the great and independent ſociety which every nation compoſes, there is no ſuperior to reſort to but the law of nature; no method to redreſs the infringements of that law, but the actual exertion of private force. As therefore between two nations, complaining of mutual injuries, the quarrel can only be decided by the law of arms; ſo in one and the ſame nation, when the fundamental principles of their common union are ſuppoſed to be invaded, and more eſpecially when the appointment of their chief magiſtrate is alleged to be unduly made, the only tribunal to which the complainants can appeal is that of the God of battles, the only proceſs by which the appeal can be carried on is that of a civil and inteſtine war. An hereditary ſucceſſion to the crown is therefore now eſtabliſhed, in this and moſt other countries, in order to prevent that periodical bloodſhed and miſery, which the hiſtory of ancient imperial Rome, and the later experience of modern times, has ſhown to be the conſequences of elective kingdoms.

2. But, ſecondly, as to the particular mode of inheritance. It in general correſponds with the feodal path of deſcents, chalked out by the common law in the ſucceſſion to landed eſtates; yet with one or two material exceptions. Like them, the crown will deſcend lineally to the iſſue of the reigning monarch; as it did from King John to Richard II. through a regular pedigree of ſix lineal generations: As in them the preference of males to females, and the right of primogeniture among the males, are ſtrictly adhered to. Thus Edward V. ſucceeded to the crown, in preference to Richard his younger brother, and Elizabeth his elder ſiſter. Like them, on failure of the male line, it deſcends to the iſſue female; according to the ancient Britiſh cuſtom remarked by Tacitus, *Solent fœminarum ductu bellare, et ſexum in imperiis non diſcernere.* Thus Mary I. ſucceeded to Edward VI.; and the line of Margaret queen of Scots, the daughter of Henry VII. ſucceeded, on failure of the line of Henry VIII. his ſon. But among the females, the crown deſcends by right of primogeniture to the eldeſt daughter only and her iſſue; and not, as in common inheritance, to all the daughters at once; the evident neceſſity of a ſole ſucceſſion to the throne having occaſioned the royal law of deſcents to depart from the common law in this reſpect: and therefore Queen Mary, on the death of her brother, ſucceeded to the crown alone, and not in partnerſhip with her ſiſter Elizabeth. Again, the doctrine of repreſentation prevails in the deſcent of the crown, as it does in other inheritances; whereby the lineal deſcendants of any perſon deceaſed ſtand in the ſame place as their anceſtor, if living, would have done. Thus Richard II. ſucceeded his grandfather Edward III. in right of his father the black prince; to the excluſion of all his uncles, his grandfather's younger children. Laſtly, on failure of lineal deſcendants, the crown goes to the next collateral relations of the late king; provided they are lineally deſcended from the blood-royal, that is, from that royal ſtock which originally acquired the crown. Thus Henry I. ſucceeded to William II. John to Richard I. and James I. to Elizabeth; being all derived from the Conqueror, who was then the only regal ſtock. But herein there is no objection (as in the caſe of common deſcents) to the ſucceſſion of a brother, an uncle, or other collateral relation, of the half-blood; that is, where the relationſhip proceeds not from the ſame couple of anceſtors (which conſtitutes a kinſman of the whole blood), but from a ſingle anceſtor only; as when two perſons are derived from the ſame father, and not from the ſame mother, or *vice verſa:* provided only, that the one anceſtor, from whom both are deſcended, be that from whoſe veins the blood-royal is communicated to each. Thus Mary I. inherited to Edward VI. and Elizabeth inherited to Mary; all born of the ſame father, King Henry VIII. but all by different mothers. See the articles CONSANGUINITY, DESCENT, and SUCCESSION.

3. The doctrine of hereditary right does by no means imply an indefeaſible right to the throne. No man will aſſert this, who has conſidered our laws, conſtitution, and hiſtory, without prejudice, and with any degree of attention. It is unqueſtionably in the breaſt of the ſupreme legiſlative authority of this kingdom, the king and both houſes of parliament, to defeat this hereditary right; and by particular entails, limitations, and proviſions, to exclude the immediate heir, and veſt the inheritance in any one elſe. This is ſtrictly conſonant to our laws and conſtitution; as may be gathered from the expreſſion ſo frequently uſed in our ſtatute-book, of "the king's majeſty, his heirs, and ſucceſſors." In which we may obſerve, that as the word heirs neceſſarily implies an inheritance or hereditary right generally ſubſiſting in the royal perſon; ſo the word *ſucceſſors*, diſtinctly taken, muſt imply that this inheritance may ſometimes be broken through; or, that there may be a ſucceſſor, without being the heir of the king. And this is ſo extremely reaſonable, that without ſuch a power, lodged ſomewhere, our polity would be very defective. For, let us barely ſuppoſe ſo melancholy a caſe, as that the heir-apparent ſhould be a lunatic, an idiot, or otherwiſe incapable of reigning; how miſerable would the condition of the nation be, if he were alſo incapable of being ſet aſide; —It is therefore neceſſary that this power ſhould be lodged ſomewhere; and yet the inheritance and regal dignity would be very precarious indeed, if this power were expreſsly and avowedly lodged in the hands of the ſubject only, to be exerted whenever prejudice, caprice, or diſcontent, ſhould happen to take the lead. Conſequently it can nowhere be ſo properly lodged as in the two houſes of parliament, by and with the conſent of the reigning king; who, it is not to be ſuppoſed, will agree to any thing improperly prejudicial to the rights of his own deſcendants. And therefore in the

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the king, lords, and commons, and parliament assembled, our laws have expressly lodged it.

4. But, fourthly, However the crown may be limited or transferred, it still retains its descendible quality, and becomes hereditary in the wearer of it. And hence in our law the king is said never to die in his political capacity; though, in common with other men, he is subject to mortality in his natural: because immediately upon the natural death of Henry, William, or Edward, the king survives in his successor. For the right of the crown vests, *eo instanti*, upon his heir; either the *hæres natus*, if the course of descent remains unimpeached, or the *hæres factus*, if the inheritance be under any particular settlement. So that there can be no interregnum; but, as Sir Matthew Hale observes, the right of sovereignty is fully invested in the successor by the very descent of the crown. And therefore, however acquired, it becomes in him absolutely hereditary, unless by the rules of the limitation it is otherwise ordered and determined: In the same manner as landed estates, to continue our former comparison, are by the law hereditary, or descendible to the heirs of the owner; but still there exists a power, by which the property of those lands may be transferred to another person. If this transfer be made simply and absolutely, the lands will be hereditary in the new owner, and descend to his heir at law: but if the transfer be clogged with any limitations, conditions, or entails, the lands must descend in that channel, so limited and prescribed, and no other. See Succession.

HEREDITAS JACENS, in *Scots Law*. An estate is said to be *in hereditate jacente*, after the proprietor's death till the heir's entry.

HEREFORD, which in Saxon signifies *the ford of the army*, the capital of Herefordshire in England, situated in W. Long. 2. 35. N. Lat. 52. 6. It is supposed to have risen out of the ruins of Kenchester, in its neighbourhood, which Camden believes to have been the *Ariconium* of Antoninus. It is very pleasantly situated among meadows and corn-fields, and is almost encompassed with rivers. It seems to have owed its rise, or at least its increase, to the building and dedicating a church there to Ethelbert king of the East Angles, who was murdered in the neighbourhood, and afterwards taken into the catalogue of martyrs; soon after it became a bishop's see, and in consequence of that a considerable place. In 1055 it was sacked, the cathedral destroyed, and its bishop Leofgar carried away captive by Gryffin prince of South-Wales, and Algar, an Englishman, who had rebelled against Edward the Confessor. Harold fortified it with a broad and high rampart; and it appears by Doomsday-book, that there were no more than 300 men within and without the wall. A very large and strong castle was built by the Normans along the Wye, and the city walled round. The present stately cathedral was founded in the reign of Henry I. by Bishop Reinelm, but enlarged and beautified by his successors. It suffered much in the barons wars; and was often taken and retaken in the war between King Charles I. and the parliament. This city is pretty large, and had once six churches; but two were destroyed in the civil wars. It is not very populous nor well built, many of the houses being old. Its manufactures are gloves and other leathern goods; and its corporation consists of a mayor, six aldermen, a high steward, deputy-steward, and town-clerk; who have a sword-bearer and four serjeants at mace. Each of the companies enjoys distinct laws and privileges by their charter, and each has its hall. The cathedral, which was built in 1050, and destroyed by the Welsh in 1060, but rebuilt in the reign of the Conqueror, or, as some say, in that of Henry I. is a beautiful and magnificent structure, but being greatly decayed, part of it was destroyed by the fall of the tower in September 1786, and the spire on another tower was taken down to be rebuilt at the same time. Here is an hospital well endowed for 16 poor people; and two charity-schools, one for 60 boys, the other for 40 girls. The chapter-house, which was once a very elegant building, built about the year 1079, is now in ruins Here were formerly two or three priories. Almost the only drink here is cyder, which is both cheap and good, the very hedges in the country being planted with apple-trees. The city gave the title of *earl* to the noble family of the Bohuns; then of *duke* to Henry of Lancaster, afterwards Henry IV. king of England; after him, of *earl* to Stafford earl of Buckingham; then of *viscount* to Devereux earl of Essex, which a collateral branch of his family still enjoys, and is thereby the premier viscount of England.

Herefordshire.

HEREFORDSHIRE, a county of England nearly of a circular form, bounded on the east by Worcester and Gloucester, on the south by Monmouthshire, on the west by Radnorshire and Brecknockshire, and on the north by Shropshire. Its length from north to south is 46 miles, its breadth from east to west 40. It contains 8 market towns, 87 vicarages, 176 parishes, and 391 villages. This county contains, according to the returns made to the house of commons, in consequence of an act of parliament, passed in 1801 for ascertaining the population of the kingdom, 17,003 houses, occupied by 18,822 families; of this number 43,955 were males, and 45,236 females; 31,261 persons were employed in agriculture, and, 8588 in trade, manufactures, &c. The total number amounted to 89,191 persons. It is divided into 11 hundreds, and sends eight members to parliament, namely, two knights for the shire, and two for each of the following towns, Hereford, Lempster or Leominster, and Weobly.

The air of this county is allowed to be as pleasant, sweet, and wholesome, as that of any other in England, there being nothing either in the soil or situation to render it otherwise. The soil throughout is excellent, and inferior to none, either for grain, fruit, or pasture, supplying the inhabitants plentifully with all the necessaries of life: but that by which it is distinguished from most others, is its fruit, especially apples, of which it produces such quantities, that the cyder made of them is not only sufficient for their own consumption, though it is their ordinary drink, but also in a great measure for that of London and other parts. That in particular which is made from the apple called *redstreak*, is much admired, and has a body almost equal to that of white-wine. The county is well supplied with wood and water; for, besides lesser streams, there are the rivers Frome, Loden, Lug, Wye, Wadel, Arro, Dare, and Monow; the last of which is large, and all of them are well stored with fish, particularly the Wye, which breeds salmon. It lies in the diocese of Hereford, and Oxford circuit.

HERENAUSEN, a palace of Germany near Hanover, belonging to the king of Great Britain. Here are lodgings for all the court; and a garden of vaſt extent, in which are fine waterworks, a labyrinth, and many other curioſities worthy the obſervation of a traveller.

HERENTHALS, a town of Brabant in the Auſtrian Netherlands, in the quarter of Antwerp; ſeated on the river Nethe, in E. Long. 4. 54. N. Lat. 51. 13.

HERESY, in *Law*, an offence againſt Chriſtianity, conſiſting in a denial of ſome of its eſſential doctrines, publicly and obſtinately avowed; being defined, *ſententia rerum divinarum humano ſenſu excogitata, palam docta et pertinaciter defenſa.* And here it muſt be acknowledged that particular modes of belief, or unbelief, not tending to overturn Chriſtianity itſelf, or to ſap the foundations of morality, are by no means the object of coercion by the civil magiſtrate. What doctrines ſhall therefore be adjudged hereſy, was left by our old conſtitution to the determination of the eccleſiaſtical judge; who had herein a moſt arbitrary latitude allowed him. For the general definition of an heretic given by Lyndewode, extends to the ſmalleſt deviations from the doctrines of the holy church: *hæreticus eſt qui dubitat de fide catholica, et qui negligit ſervare ea, quæ Romana eccleſia ſtatuit, ſeu ſervare decreverat.* Or, as the ſtatute 2 Hen. IV. c. 15. expreſſes it in Engliſh, "teachers of erroneous opinions contrary to the faith and bleſſed determinations of the holy church." Very contrary this to the uſage of the firſt general councils, which defined all heretical doctrines with the utmoſt preciſion and exactneſs. And what ought to have alleviated the puniſhment, the uncertainty of the crime, ſeems to have enhanced it in thoſe days of blind zeal and pious cruelty. It is true, that the ſanctimonious hypocriſy of the canoniſts went at firſt no farther than enjoining penance, excommunication, and eccleſiaſtical deprivation, for hereſy; though afterwards they proceeded boldly to impriſonment by the ordinary, and confiſcation of goods *in pios uſus.* But in the mean time they had prevailed upon the weakneſs of bigotted princes to make the civil power ſubſervient to their purpoſes, by making hereſy not only a temporal, but even a capital, offence: the Romiſh eccleſiaſtics determining, without appeal, whatever they pleaſed to be hereſy, and ſhifting off to the ſecular arm the odium and drudgery of executions; with which they themſelves were too tender and delicate to intermeddle. Nay, they pretended to intercede and pray, on behalf of the convicted heretic, *ut citra mortis periculum ſententia circa eum moderetur:* well knowing that at the ſame time they were delivering the unhappy victim to certain death. Hence the capital puniſhments inflicted on the ancient Donatiſts and Manichæans by the emperors Theodoſius and Juſtinian: hence alſo the conſtitution of the emperor Frederic mentioned by Lyndewode, adjudging all perſons without diſtinction to be burnt with fire who were convicted of hereſy by the eccleſiaſtical judge. The ſame emperor, in another conſtitution, ordained, that if any temporal lord, when admoniſhed by the church, ſhould neglect to clear his territories of heretics within a year, it ſhould be lawful for good catholics to ſeize and occupy the lands, and utterly to exterminate the heretical poſſeſſors. And upon this foundation was built that arbitrary power, ſo long claimed and ſo fatally exerted by the Pope, of diſpoſing even of the kingdoms of refractory princes to more dutiful ſons of the church. The immediate event of this conſtitution was ſomething ſingular, and may ſerve to illuſtrate at once the gratitude of the holy ſee, and the juſt puniſhment of the royal bigot; for, upon the authority of this very conſtitution, the pope afterwards expelled this very emperor Frederic from his kingdom of Sicily, and gave it to Charles of Anjou.

Chriſtianity being thus deformed by the dæmon of perſecution upon the continent, we cannot expect that our own iſland ſhould be entirely free from the ſame ſcourge. And therefore we find among our ancient precedents a writ *de hæretico comburendo*, which is thought by ſome to be as ancient as the common law itſelf. However, it appears from thence, that the conviction of hereſy by the common law was not in any petty eccleſiaſtical court, but before the archbiſhop himſelf in a provincial ſynod; and that the delinquent was delivered over to the king to do as he ſhould pleaſe with him: ſo that the crown had a controul over the ſpiritual power, and might pardon the convict by iſſuing no proceſs againſt him; the writ *de hæretico comburendo* being not a writ of courſe, but iſſuing only by the ſpecial direction of the king in council.

But in the reign of Henry IV. when the eyes of the Chriſtian world began to open, and the ſeeds of the Proteſtant religion (though under the opprobrious name of *lollardy*) took root in this kingdom; the clergy, taking advantage from the king's dubious title to demand an increaſe of their own power, obtained an act of parliament, which ſharpened the edge of perſecution to its utmoſt keenneſs. For, by that ſtatute, the dioceſan alone, without the intervention of a ſynod, might convict of heretical tenets; and unleſs the convict abjured his opinions, or if after abjuration he relapſed, the ſheriff was bound *ex officio*, if required by the biſhop, to commit the unhappy victim to the flames, without waiting for the conſent of the crown. By the ſtatute 2 Hen. V. c. 7. lollardy was alſo made a temporal offence, and indictable in the king's courts; which did not thereby gain an excluſive, but only a concurrent, juriſdiction with the biſhop's conſiſtory.

Afterwards, when the final reformation of religion began to advance, the power of the eccleſiaſtics was ſomewhat moderated; for though what hereſy *is*, was not then preciſely defined, yet we are told in ſome points what it *is not:* the ſtatute 25 Hen. VIII. c. 14. declaring, that offences againſt the ſee of Rome are not hereſy; and the ordinary being thereby reſtrained from proceeding in any caſe upon mere ſuſpicion; that is, unleſs the party be accuſed by two credible witneſſes, or an indictment of hereſy be firſt previouſly found in the king's courts of common law. And yet the ſpirit of perſecution was not yet abated, but only diverted into a lay channel. For in ſix years afterwards, by ſtatute 31 Hen. VIII. c. 14. the bloody law of the ſix articles was made, which eſtabliſhed the ſix moſt conteſted points of popery, tranſubſtantiation, communion in one kind, the celibacy of the clergy, monaſtic vows, the ſacrifice of the maſs, and auricular confeſſion; which points were "determined and reſolved by the moſt godly ſtudy, pain, and travil of his majeſty: for which his moſt humble and obedient ſubjects, the lords *fpiritual* and temporal and the commons, in parliament affembled, did not only render and give unto his highnefs their moft high and hearty thanks;" but did alfo enact and declare all oppugners of the firft to be heretics, and to be burnt with fire; and of the five laft to be felons, and to fuffer death. The fame ftatute eftablifhed a new and mixed jurifdiction of clergy and laity for the trial and conviction of heretics; the reigning prince being then equally intent on deftroying the fupremacy of the bifhops of Rome, and eftablifhing all other their corruptions of the Chriftian religion.

Without perplexing this detail with the various repeals and revivals of thefe fanguinary laws in the two fucceeding reigns, let us proceed to the reign of Queen Elizabeth; when the reformation was finally eftablifhed with temper and decency, unfullied with party-rancour, or perfonal caprice and refentment. By ftatute 1 Eliz. c. 1. all former ftatutes belonging to herefy are repealed, which leaves the jurifdiction of herefy as it ftood at common law; viz. as to the infliction of common cenfures, in the ecclefiaftical courts; and in cafe of burning the heretic, in the provincial fynod only. Sir Matthew Hale is indeed of a different opinion, and holds that fuch power refided in the diocefan alfo; though he agrees that in either cafe the writ *de hæretico comburendo* was not demandable of common right, but grantable or otherwife merely at the king's difcretion. But the principal point now gained was, that by this ftatute a boundary is for the firft time fet to what fhall be accounted herefy; nothing for the future being to be fo determined, but only fuch tenets, as have been heretofore fo declared, 1. By the words of the holy fcriptures; or, 2. By the firft four general councils, or fuch others as have only ufed the words of the holy fcriptures; or, 3. Which fhall hereafter be fo declared by the parliament, with the affent of the clergy in convocation. Thus was herefy reduced to a greater certainty than before; though it might not have been the worfe to have defined it in terms ftill more precife and particular: as a man continued ftill liable to be burnt, for what perhaps he did not underftand to be herefy, till the ecclefiaftical judge fo interpreted the words of the canonical fcriptures.

For the writ *de hæretico comburendo* remained ftill in force; and we have inftances of its being put in execution upon two Anabaptifts in the feventeenth of Elizabeth, and two Arians in the ninth of James I. But it was totally abolifhed, and herefy again fubjected only to ecclefiaftical correction, *pro falute animæ*, by virtue of the ftatute 29 Car. II. c. 9.: for, in one and the fame reign, our lands were delivered from the flavery of military tenures; our bodies from arbitrary imprifonment by the *habeas corpus* act; and our minds from the tyranny of fuperftitious bigotry, by demolifhing this laft badge of perfecution in the Englifh law.

Every thing is now as it fhould be, with refpect to the fpiritual cognizance, and fpiritual punifhment of herefy: unlefs perhaps that the crime ought to be more ftrictly defined, and no perfecution permitted, even in the ecclefiaftical courts, till the tenets in queftion are by proper authority previoufly declared to be heretical. Under thefe reftrictions, it feems neceffary for the fupport of the national religion, that the officers of the church fhould have power to cenfure heretics; yet not to harafs them with temporal penalties, much lefs to exterminate or deftroy them. The legiflature hath indeed thought it proper, that the civil magiftrate fhould again interpofe, with regard to one fpecies of herefy very prevalent in modern times; for by ftatute 9 & 10 W. III. c. 32. if any perfon educated in the Chriftian religion, or profeffing the fame, fhall by writing, printing, teaching, or advifed fpeaking, deny any one of the perfons in the Holy Trinity to be God, or maintain that there are more gods than one, he fhall undergo the fame penalties and incapacities which were juft now mentioned to be inflicted on apoftacy by the fame ftatute.

HERETIC, a general name for all fuch perfons under any religion, but efpecially the Chriftian, as profefs or teach religious opinions contrary to the eftablifhed faith, or to what is made the ftandard of orthodoxy. See HERESY.

HERETOCHS, among our Saxon anceftors, fignified the fame with dukes or duces, denoting the commanders or leaders of their armies.

It appears, from Edward the Confeffor's laws, that the military force of this kingdom was in the hands of the dukes or heretochs, who were conftituted through every province and county in the kingdom, being felected out of the principal nobility, and fuch as were moft remarkable for being *fapientes, fideles, & animofi*. Their duty was to lead and regulate the Englifh armies, with a very unlimited power; and becaufe of their great power, they were elected by the people in their full affembly, or folkmote, in the fame manner as fheriffs were elected.

HERFORDEN, or HERWARDEN, a free and imperial town of Germany, in the circle of Weftphalia, and capital of the county of Ravenfberg. Here is a famous nunnery belonging to the Proteftants of the confeffion of Augfburg, whofe abbefs is a princefs of the empire, and has a voice and place in the diet. It is feated on the river Aa. E. Long. 8. 47. N. Lat. 52. 12.

HERGRUNDT, a town of Upper Hungary, remarkable for its rich mines of vitriol. Thofe who work in the mines have built a fubterraneous town, which has a great number of inhabitants. E. Long. 18. 15. N. Lat. 48. 30.

HERIOT, in *Law*, a cuftomary tribute of goods and chattels, payable to the lord of the fee on the deceafe of the owner of the land. See TENURE.

Heriot is of two forts—viz. 1. Heriot-cuftom, where heriots have been paid time out of mind by cuftom, after the death of a tenant for life. In fome places, there is a cuftomary compofition in money, as 10 or 20 fhillings in lieu of a heriot, by which the lord and tenant are both bound, if it be an indifputably ancient cuftom; but a new compofition of this fort will not bind the reprefentatives of either party. 2. Heriot-fervice, when a tenant holds by fuch fervice to pay heriot at the time of his death; which fervice is expreffed in the deed of feoffment.—For this latter the lord fhall diftrain; and for the other he fhall feize, and not diftrain. If the lord purchafe part of the tenancy, heriot-fervice is extinguifhed; but it is not fo of heriot-cuftom.

HERISSON, in *Fortification*, a beam armed with a great number of iron fpikes with their points outwards, and fupported by a pivot on which it turns. Thefe ferve as a barrier to block up any paffage, and are frequently placed before the gates, and more efpecially the wicket-doors, of a town or fortrefs, to fecure thofe those passages which must of necessity be often opened and shut.

HERITABLE RIGHTS, in *Scots Law*, signify all rights affecting lands, houses, &c. or any immoveable subject.

HERITAGE, in *Scots Law*, lands, houses, or any immoveable subject, in contradistinction to moveables or moveable subjects. It also sometimes signifies such immoveable property as a person succeeds to as heir to another, in contradistinction to that which he himself purchases or acquires in any other manner, called *conquest*.

HERMÆA, in antiquity, ancient Greek festivals in honour of the god Hermes or Mercury. One of these was celebrated by the Pheneatæ in Arcadia; a second by the Cyllenians in Elis; and a third by the Tanagræans, where Mercury was represented with a ram upon his shoulder, because he was said to have walked through the city in that posture in time of a plague, and to have cured the sick; in memory of which, it was customary at this festival for one of the most beautiful youths in the city to walk round the walls with a ram upon his shoulder.—A fourth festival of the same name was observed in Crete, when it was usual for the servants to sit down at the table while their masters waited; a custom which was also observed at the Roman Saturnalia.

HERMANN, PAUL, a celebrated botanist, was born at Halle in Saxony, and practised physic in the island of Ceylon, and the Cape of Good Hope, after which (in 1679) he was chosen professor of botany at Leyden, and superintendant of the botanical garden, in which science he obtained the highest reputation, and died in the year 1695. His first publication, in 1687, was a catalogue of plants in the garden of the university,—a garden which, in seven years he had so much enriched with plants from the East and West Indies, that it nearly rivalled the very first in Europe. His method of botanical classification is contained in his *Floræ Lugduno-Batavæ Flores*, published in 1690. His *Paradisus Batavus*, &c. was published after his decease, by William Sherard, which contains many rare, and some entirely new species, delineated in a very elegant manner. The rest of Hermann's works are, *Musæi Indici Catalogus, continens varia exotica animalia, insecta, vegetabilia, mineralia; Lapis Lydius Materiæ Medicæ*, in which last his new characters of plants are made use of to illustrate their medical properties. At his death he left behind him 450 fine drawings, and a numerous collection of dried plants, which served for the basis of the *Flora Ceylanica* of Linnæus, and also a catalogue of plants of the Cape of Good Hope. Dr Hannes addressed to him a beautiful Latin ode, which is still preserved; but many of the treasures of his industrious life were strangely neglected, and allowed to be dispersed.

HERMANNIA, a genus of plants belonging to the monodelphia class, and in the natural method ranking under the 37th order, *Columniferæ*.

HERMANSTADT, a handsome, populous, and strong town of Hungary, capital of Transilvania, with a bishop's see. It is the residence of the governor of the province; and is seated on the river Ceben, in E. Long. 24. 40. N. Lat. 46. 25.

HERMAPHRODITE, is generally understood to signify a human creature possessed of both sexes, or who has the parts of generation both of male and female. The term however is applied also to other animals, and even to plants.—The word is formed of the Greek Ἑρμαφρόδιτος, a compound of Ἑρμης *Mercury*, and Αφροδιτη *Venus*; q. d. a mixture of Mercury and Venus, i. e. of male and female. For it is to be observed, *Hermaphroditus* was originally a proper name, applied by the heathen mythologists to a fabulous deity, whom some represent as a son of *Hermes*, Mercury, and *Aphrodite*, Venus; and who, being desperately in love with the nymph Salmasis, obtained of the gods to have his body and hers united into one. Others say, that the god Hermaphroditus was conceived as a composition of Mercury and Venus; to exhibit the union between eloquence, or rather commerce, whereof Mercury was god, with pleasure, whereof Venus was the proper deity. Lastly, others think this junction intended to show that Venus (pleasure) was of both sexes; as, in effect, the poet Calvus calls Venus a god.

Pollentemque Deum Venerem.

As also Virgil, Æneid, lib. ii.

Discedo, ac ducente Deo flammam inter et hostes
Expeditor————

M. Spon observes, Hesychius calls Venus *Aphroditos*: and Theophrastus affirms, that Aphroditos, or Venus, is *Hermaphroditus*; and that in the island of Cyprus she has a statue, which represents her with a beard like a man.—The Greeks also call *hermaphrodites* ἀνδρόγυνοι, *androgyni*, q. d. men-women. See the article ANDROGYNES.

In a treatise by Mr Hunter, in the 69th volume of the Philosophical Transactions, hermaphrodites are divided into *natural* and *unnatural* or monstrous. The first belongs to the more simple orders of animals, of which there are a much greater number than of the more perfect. The unnatural takes place in every tribe of animals having distinct sexes, but is more common in some than in others. The human species, our author imagines, has the fewest; never having seen them in that species, nor in dogs; but in the horse, sheep, and black cattle, they are very frequent.

From Mr Hunter's account, however, it does not appear that such a creature as a perfect hermaphrodite has ever existed. All the hermaphrodites which he had the opportunity of seeing had the appearance of females, and were generally saved as such. In the horse they are very frequent; and in the most perfect of this kind he ever saw, the testicles had come down out of the abdomen into the place where the udder should have been, and appeared like an udder, not so pendulous as the scrotum in the male of such animals. There were also two nipples, of which horses have no perfect form; being blended in them with the sheath or prepuce, of which there was none here. The external female parts were exactly similar to those of a perfect female; but instead of a common-sized clitoris, there was one about five or six inches long; which when erect, stood almost directly backwards.

A foal ass very similar to the above was killed, and the following appearances were observed on dissection. The testicles were not come down as in the former, possibly

Hermaphrodite.

possibly because the creature was too young. It had also two nipples; but there was no penis passing round the pubes to the belly, as in the perfect male ass. The external female parts were similar to those of the she-ass. Within the entrance of the vagina was placed the clitoris; but much longer than that of a true female, being about five inches long. The vagina was open a little farther than the opening of the urethra into it, and then became obliterated: from thence, up to the fundus of the uterus, there was no canal. At the fundus of the common uterus it was hollow, or had a cavity in it, and then divided into two, viz. a right and a left, called the *horns* of the uterus, which were also pervious. Beyond the termination of the two horns were placed the ovaria, as in the true female; but the Fallopian tubes could not be found.—From the broad ligaments, to the edges of which the horns of the uterus and ovaria were attached, there passed towards each groin a part similar to the round ligaments in the female, which were continued into the rings of the abdominal muscles; but with this difference, that there were continued with them a process or theca of the peritonæum, similar to the tunica vaginalis communis in the male ass; and in these theca were found the testicles, but no vasa deferentia could be observed passing from them.

In most species of animals, the production of hermaphrodites appears to be the effect of chance; but in the black cattle it seems to be an established principle of their propagation. It is a well known fact, and, as far as has yet been discovered, appears to be universal, that when a cow brings forth two calves, one of them a bull, and the other a cow to appearance, the cow is unfit for propagation, but the bull-calf becomes a very proper bull. They are known not to breed; they do not show the least inclination for the bull, nor does the bull ever take the least notice of them. Among the country people in England, this kind of calf is called a *free-martin*; and this singularity is just as well known among the farmers as either cow or bull. When they are preserved, it is for the purposes of an ox or spayed heifer; viz. to yoke with the oxen, or fatten for the table. They are much larger than either the bull or the cow, and the horns grow longer and bigger, being very similar to those of an ox. The bellow of a free-martin is also similar to that of an ox, and the meat is similar to that of the ox or spayed heifer, viz. much finer in the fibre than either the bull or cow; and they are more susceptible of growing fat with good food. By some they are supposed to exceed the ox and heifer in delicacy of taste, and bear a higher price at market; this, however, does not always hold, and Mr Hunter gives an instance of the contrary. The Romans, who called the bull *taurus*, spoke also of *tauræ* in the feminine gender different from cows. Stephens observes, that it was thought they meant by this word *barren cows*, who obtained the name because they did not conceive any more than bulls. He also quotes a passage from Columella, lib. vi. cap. 22. "And, like the *tauræ*, which occupy the place of fertile cows, should be rejected or sent away." He likewise quotes Varro, *De re rustica*, lib. ii. cap. 5. "The cow which is barren is called *taura*." From which we may reasonably conjecture, that the Romans had not the idea of the circumstances of their production.

Of these creatures Mr Hunter dissected three, and the following appearances were observed in the most perfect of them.—The external parts were rather smaller than in the cow. The vagina passed on as in the cow to the opening of the urethra, and then it began to contract into a small canal, which passed on to the division of the uterus into the two horns; each horn passing along the edge of the broad ligament laterally towards the ovaria. At the termination of these horns were placed both the ovaria and testicles, both of which were nearly about the size of a small nutmeg. No Fallopian tubes could be found. To the testicles were vasa deferentia, but imperfect. The left one did not come near the testicle; the right only came close to it, but did not terminate in the body called *epididymis*. They were both pervious, and opened into the vagina near the opening of the urethra.—On the posterior surface of the bladder, or between the uterus and bladder, were the two bags called the *vesiculæ seminales* in the male, but much smaller than what they are in the bull: the ducts opened along with the vasa deferentia.

Concerning hermaphrodites of the human species, much has been written, and many laws enacted about them in different nations; but the existence of them is still disputed. Dr Parsons has given us a treatise on the subject, in which he endeavours to explode the notion as a vulgar error. According to him, all the hermaphrodites that have appeared, were only women whose clitoris from some cause or other was overgrown; and, in particular, that this was the case with an Angola woman shown at London as an hermaphrodite some time ago.

Among the reptile tribe, indeed, such as worms, snails, leeches, &c. hermaphrodites are very frequent. In the memoirs of the French academy, we have an account of this very extraordinary kind of hermaphrodites, which not only have both sexes, but do the office of both at the same time. Such are earth-worms, round-tailed worms found in the intestines of men and horses, land-snails, and those of fresh waters, and all the sorts of leeches. And, as all these are reptiles, and without bones, M. Poupart concludes it probable, that all other insects which have these two characters are also hermaphrodites.

The method of coupling practised in this class of hermaphrodites, may be illustrated in the instance of earth-worms. These little creatures creep, two by two, out of holes proper to receive them, where they dispose their bodies in such a manner, as that the head of the one is turned to the tail of the other. Being thus stretched lengthwise, a little conical button or papilla is thrust forth by each, and received into an aperture of the other. These animals, being male in one part of the body, and female in another, and the body flexible withal, M. Homberg does not think it impossible but that an earth-worm may couple with itself, and be both father and mother of its young; an observation which, to some, appears highly extravagant.

Among the insects of the soft or boneless kind, there are great numbers indeed, which are so far from being hermaphrodites, that they are of no sex at all. Of this kind are all the caterpillars, maggots, and worms, produced of the eggs of flies of all kinds: but the reason of

Hermaphrodite || Hermes.

of this is plain; these are not animals in a perfect state, but disguises under which animals lurk. They have no business with the propagating of their species, but are to be transformed into animals of another kind, by the putting off their several coverings, and then only they are in their perfect state, and therefore then only show the differences of sex, which are always in the distinct animals, each being only male or female. These copulate, and their eggs produce these creatures, which show no sex till they arrive at that perfect state again.

HERMAPHRODITE *Flowers*, in *Botany*. These are so called by the sexualists on account of their containing both the antheræ and stigma, the supposed organs of generation, within the same calyx and petals. Of this kind are the flowers of all the classes in Linnæus's sexual method, except the classes *monœcia* and *diœcia;* in the former of which, male and female flowers are produced on the same root; in the latter, in distinct plants from the same seed.—In the class *polygamia*, there are always hermaphrodite flowers mixed with male or female, or both, either on the same or distinct roots. In the plaintain-tree the flowers are all hermaphrodite; in some, however, the antheræ or male organ, in others the stigma or female organ, proves abortive. The flowers in the former class are styled *female hermaphrodites;* in the latter, *male hermaphrodites.*—Hermaphrodites are thus as frequent in the vegetable kingdom as they are rare and scarce in the animal one.

HERMAS, an ecclesiastical author of the first century; and according to Origen, Eusebius, and Jerome, the same whom St Paul salutes in the end of his epistle to the Romans. He wrote a book in Greek some time before Domitian's persecution, which happened in the year 95. This work is entitled *The Pastor*, from his representing an angel speaking to him in it under the form of a shepherd. The Greek text is lost, but a very ancient Latin version of it is still extant. Some of the fathers have considered this book as canonical. The best edition of it is that of 1698, where it is to be found among the other apostolical fathers, illustrated with the notes and corrections of Cotelerius and Le Clerc. With them it was translated into English by Archbishop Wake, the best edition of which is that of 1710.

HERMAS, a genus of plants belonging to the polygamia class. See BOTANY *Index*.

HERMES, or HERMA, among antiquaries, a sort of square or cubical figure of the god Mercury, usually made of marble, though sometimes of brass or other materials, without arms or legs, and planted by the Greeks and Romans in their cross-ways.

Servius gives us the origin thereof, in his comment on the eighth book of the Æneid. Some shepherds, says he, having one day caught Mercury, called by the Greeks *Hermes*, asleep on a mountain, cut off his hands; from which he, as well as the mountain where the action was done, became denominated Cyllenius, from κυλλος, *maimed:* and thence, adds Servius, it is that certain statues without arms are denominated *Hermeses* or *Hermæ.* But this etymology of the epithet of Cyllenius contradicts most of the other ancient authors; who derive it hence, that Mercury was borne at Cyllene a city of Elis, or even on the mountain Cyllene itself, which had been thus called before him.

Hermetic || Hermharpocrates.

Suidas gives a moral explication of this custom of making statues of Mercury without arms. The Hermeses, says he, were statues of stone placed at the vestibules or porches of the doors and temples at Athens; for this reason, that as Mercury was held the god of speech and of truth, square and cubical statues were peculiarly proper; having this in common with truth, that on what side soever they are viewed, they always appear the same.

It must be observed, that Athens abounded more than any other place in Hermeses: there were abundance of very signal ones in divers parts of the city, and they were indeed one of the principal ornaments of the place. They were also placed in the high-roads and cross-ways, because Mercury, who was the courier of the gods, presided over the highways; whence he had his surname of Trivius, from *trivium;* and that of Viacus, from *via.*

From Suidas's account, above cited, it appears, that the terms, *termini*, used among us in the door-cases, balconies, &c. of our buildings, take their origin from these Athenian Hermeses, and that it was more proper to call them *hermetes* than *termini*, because, though the Roman termini were square stones, whereon a hand was frequently placed, yet they were rather used as land-marks and mere stones than as ornaments of building. See the articles MERCURY and THOTH.

HERMETIC, or HERMETICAL *Art*, a name given to chemistry, on a supposition that Hermes Trismegistus was the inventor thereof, or that he excelled therein. See THOTH.

HERMETICAL *Philosophy* is that which undertakes to solve and explain all the phenomena of nature, from the three chemical principles, salt, sulphur, and mercury.

HERMETICAL *Physic*, or *Medicine*, is that system or hypothesis in the art of healing, which explains the causes of diseases, and the operations of medicine, on the principles of the hermetical philosophy, and particularly on the system of alkali and acid.

HERMETICAL *Seal*, a manner of stopping or closing glass vessels, for chemical operations, so very accurately, that nothing can exhale or escape, not even the most subtile spirits. It is performed by heating the neck of the vessel in the flame of a lamp till it be ready to melt, and then with a pair of pincers twisting it close together. This they call putting on *Hermes's seal.* There are also other ways of sealing vessels hermetically; viz. by stopping them with a plug or stopple of glass, well luted into the neck of the vessel; or by turning another ovum philosophicum upon that wherein the matter is contained.

HERMHARPOCRATES, or HERMARPOCRATES, in antiquity, a deity, or figure of a deity, composed of Mercury, and Harpocrates the god of Silence.

M. Spon gives us a hermharpocrates in his *Rech. Cur. de l'Antiquité*, p. 98. fig. 15. having wings on his feet like Mercury, and laying his finger on his mouth like Harpocrates. It is probable they might mean, by this combination, that silence is sometimes eloquent.

HERMIANI, or HERMIATITÆ, a ſect of heretics in the ſecond century, thus called from their leader Hermias. They were alſo denominated *Seleuciani.*

One of their diſtinguiſhing tenets was, that God is corporeal. Another, that Jeſus Chriſt did not aſcend into heaven with his body, but left it in the ſun.

HERMIONE, in *Ancient Geography*, a conſiderable city of Argolis. It was in ruins (except a few temples) in the time of Pauſanias; who ſays that the new city was at the diſtance of four ſtadia from the promontory on which the temple of Neptune ſtood. It gave name to the Sinus Hermionicus, a part of the Sinus Argolicus.

HERMIT, or EREMIT, *Eremita*, a devout perſon retired into ſolitude, to be more at leiſure for prayer and contemplation, and to diſencumber himſelf of the affairs of this world.—The word is formed from the Greek ερημος, *deſert* or *wilderneſs*; and according to the etymology, ſhould rather be wrote *Eremit.*

Paul ſurnamed the *Hermit*, is uſually reckoned the firſt hermit; though St Jerome at the beginning of the life of that ſaint ſays, it is not known who was the firſt.—Some go back to John the Baptiſt, others to Elias: others make St Anthony the founder of the eremitical life; but others think that he only rekindled and heightened the fervour thereof, and hold that the diſciples of that ſaint owned St Paul of Thebes for the firſt that practiſed it. The perſecutions of Decius and Valerian are ſuppoſed to have been the occaſion.—Several of the ancient hermits, as St Anthony, &c. though they lived in deſerts, had yet numbers of religious accompanying them.

There are alſo various orders and congregations of religious diſtinguiſhed by the title of *hermits*; as, hermits of St Auguſtine, of St John Baptiſt, of St Jerome, of St Paul, &c.

HERMIT *the*, *Peter Gautier*, a French officer of Amiens in Picardy, who quitted the military profeſſion, and commenced hermit and pilgrim. He travelled to the Holy Land about the year 1093; and making a melancholy recital of the deplorable ſituation of a few Chriſtians in that country to Pope Urban II. and at the ſame time enthuſiaſtically lamenting that Infidels ſhould be in poſſeſſion of the famous city where the Author of Chriſtianity firſt promulgated his ſacred doctrines, Urban gave him a fatal commiſſion to excite all Chriſtian princes to a general war againſt the Turks and Saracens the poſſeſſors of the Holy Land. See CROISADE.

HERMITAGE properly ſignifies a little hut or habitation, in ſome deſert place, where a hermit dwells.

Hermitage is alſo popularly attributed to any religious cell, built and endowed in a private and recluſe place, and thus annexed to ſome large abbey, of which the ſuperior was called *hermita.*

HERMODACTYL, in the *Materia Medica*, a root brought from Turkey. It is of the ſhape of a heart flatted, of a white colour, compact, yet eaſy to be cut or powdered; of a viſcous ſweetiſh taſte, with a light degree of acrimony. Hermodactyls were of great repute among the ancients as a cathartic; but thoſe we now meet with in the ſhops have very little purgative virtue; Neumann declares he never found them to have any effect at all.—The hermodactyl is the root of the Colchicum variegatum, according to ſome; others ſuppoſe it to be the root of the iris tuberoſa.

HERMOGENES, the firſt and moſt celebrated architect of antiquity, was, according to Vitruvius, born at Alanbada, a city in Caria. He built a temple of Diana at Magneſia; another of Bacchus at Tros; and was the inventor of ſeveral parts of architecture. He compoſed a book on the ſubject, which is loſt.

HERMOGENES-*Tarſenſis*, a rhetorician and orator, and who was in every reſpect a prodigy. At 17 years of age he publiſhed his ſyſtem of rhetoric, and at 20 his philoſophic ideas: but at 25 he forgot every thing he had known. It is ſaid, that his body being opened after his death, his heart was found of an extraordinary ſize, and all over hairy. He died about 168 B. C.

HERMOGENIANS, a ſect of ancient heretics, denominated from their leader Hermogenes, who lived towards the cloſe of the ſecond century. Hermogenes eſtabliſhed matter as his firſt principle; and regarding matter as the fountain of all evil, he maintained that the world, and every thing contained in it, as alſo the ſouls of men and other ſpirits, were formed by the Deity from an uncreated and eternal maſs of corrupt matter. The matter of Hermogenes, with regard to the origin of the world and the nature of the ſoul, were warmly oppoſed by Tertullian.

The Hermogenians were divided into ſeveral branches under their reſpective chieftains, viz. Hermiani, Seleucians, Materiari, &c.

HERMON, or AERMON, in *Ancient Geography*, a mountain of the Amorites, called *Sanior* by the Phœnicians, and *Sanir* or *Senir* by the Amorites, on the eaſt of Jordan. It is alſo called *Sion*, (Moſes); but muſt not be confounded with the Sion of Jeruſalem. By the Sidonians it was called *Scirion*; in the vulgate, it is called *Sarion*. Joſhua informs us, that it was the dominion of Og king of Baſhan; which muſt be underſtood of its ſouth ſide. It is never particularly mentioned by profane writers; being compriſed under the appellation *Libanus*, or *Antilibanus*, with which mountain it is joined to the eaſt. It is alſo called *Hermonium* plurally, Pſalm xlii. 6. becauſe it was extenſive, and contained ſeveral mountains.

HERMOPOLIS, in *Ancient Geography*, the name of ſeveral cities in Egypt, dedicated as the name imports, to Hermes or Mercury. Near one of theſe cities, probably Hermopolis Magna, was ſituated a moſt magnificent temple, of which the portico only now remains. It was viſited by Denon who accompanied the French army in their expedition to Egypt, in 1799; and he deſcribes it as a moſt beautiful monument of ancient architecture, and a ſplendid relic of the higheſt antiquity. Among the hillocks within 300 or 400 yards of the portico, enormous blocks of ſtone are ſeen buried in ſand, and regular architecture beneath them, which appear to form an edifice containing columns of granite, juſt riſing above the preſent level of the ſoil. Every part of this edifice is covered with hieroglyphics. Connected with the ſcattered fragments of the great temple, a moſque has been built, in which is a number of columns of cipoline marble. Near this is the village of Achmunin, which contains 5000 inhabitants.

HERMUS, in *Ancient Geography*, a river of Ionia; which

which rising near Dorylæum, a town of Phrygia, in a mountain sacred to Dindymene or Cybele, touched Mysia, and ran through the Regio Combusta, then through the plains of Smyrna down to the sea, carrying along with it the Pactolus, Hyllus, and other less noble rivers. Its waters were said, by Virgil and other poets, to roll down gold.

HERNANDRIA, Jack-in-a-box-tree: a genus of plants belonging to the monœcia class; and in the natural method ranking under the 38th order, *Tricoccæ*. See Botany *Index*.

HERNE, a town of Kent, six miles from Canterbury, 12 from Margate, and 14 from Feversham. The church is a large ancient structure, with a tower of flint, and has six stalls of the cathedral kind, with divisions of the choir from the nave by a carved screen of oak. The church is 113 feet long. The stone font is very ancient. Here the great Dr Ridley, the English martyr, was vicar. Here is a commodious bay, frequented by colliers, &c.

HERNIA, in *Medicine* and *Surgery*, a descent of the intestines or omentum out of their natural place; or rather, the tumour formed by that descent, popularly called a rupture. The word is Latin, *hernia*, and originally signifies the same with *tumor scroti*, called also *ramex*. Priscian observes, that the ancient Marsi gave the appellation *hernia* to rocks; whence some will have hernias thus called *propter duritiem*, on account of their hardness. Scaliger chooses rather to derive the word from the Greek ἑρνος, *ramus*, branch. See Surgery *Index*.

HERNIARIA, rupture-wort, a genus of plants belonging to the pentandria class; and in the natural method ranking under the 11th order, *Sarmentaceæ*. See Botany *Index*.

HERO, in Pagan mythology, a great and illustrious person, of a mortal nature, though supposed by the populace to partake of immortality, and after his death to be placed among the number of the gods. The word is formed of the Latin *heros*, and that of the Greek ἥρως *semi-deus*, "demi-god."—The Greeks erected columns and other monuments over the tombs of their heroes, and established a kind of worship in honour of the manes both of their heroes and heroines. The Romans also raised statues in honour of their heroes; but there were six of their heroes of a superior order, and who were supposed to be admitted into the community of the twelve great gods: these were Hercules, Bacchus, Esculapius, Romulus, Castor, and Pollux. Writers have distinguished between the worship which the ancients paid to their heroes and that offered to their gods. The latter, it is said, consisted of sacrifices and libations; the former was only a kind of funeral honour, in which they celebrated their exploits, concluding the rehearsal with feasts.

Hero is also used in a more extensive sense, for a great, illustrious, and extraordinary personage; particularly in respect of virtues.

F. Bouhours makes this distinction between a great man and a hero, that the latter is more daring, fierce, and enterprising: and the former more prudent, thoughtful, and reserved. In this sense we properly say, Alexander was a hero, Julius Cæsar a great man.

Hero of a poem or *romance*, is the principal personage, or he who has the chief part in it. Thus the hero of the Iliad is Achilles; of the Odyssey, Ulysses; of the Æneid, Æneas; of Tasso's Jerusalem, Godfrey of Boulogne; of Milton's Paradise Lost, Adam; though Mr Dryden will have the devil to be Milton's hero, because he gets the better of Adam, and drives him out of Paradise.

Hero, in fabulous history, a famous priestess of Venus, lived at Abydos, in a tower situated on the banks of the Hellespont. She being beloved by Leander, who lived at Sestos on the other side of the strait, he every night swam over to visit her, being directed by a light fixed on the tower. But the light being put out in a stormy night, the youth missed his way, and was drowned; on which Hero threw herself into the sea, and perished.

Hero, the name of two celebrated Greek mathematicians; the one called the *old*, and the other the *young*, *Hero*. The younger was a disciple of Ctesibius. They are known by two works translated into Latin by Barochius; *Spiralium liber*, by Hero senior; and *Tractat. artis et machin. militar.* by Hero junior. They flourished about 130 and 100 B. C.

HEROD, surnamed the Great, was born about 71 years before the commencement of the Christian era. When about 25 years of age, his father Antipater made him governor of Galilee, where he distinguished himself by suppressing a band of robbers, and executing their ringleader. For this action, as it was performed by his own authority, and without trial of the criminals, he was ordered to appear before the sanhedrim; but by the influence of his party and the favour of the high priest, he escaped judgment. During the civil war between the republican and Cæsarian parties, Herod joined Cassius, and was made governor of Cœlesyria. He caused Malichus to be assassinated for having poisoned his father, and ingratiated himself with Mark Antony. After being an exile for some time in Egypt, he found means to arrive at Rome, where Antony received him with great kindness, and the senate made choice of him to the crown of Judea, about 40 years before the birth of Christ. It was in the possession of Antigonus at that time, and he had consequently to fight his way to it. He was finally victorious, Antigonus was taken prisoner, and Herod succeeded to the regal dignity in the year 37 before Christ. In filling his empty coffers he was guilty of many cruel extortions, and it is but just to add, that he performed many acts of clemency. He sent for the aged high priest Hyrcan, who had been deposed, and treated him with the greatest kindness, and raised Aristobulus, the brother of his beloved Mariamne, to the pontifical dignity. Soon after, indeed, from a fit of jealousy, he caused him to be drowned in a bath. He was accused to Antony by his mother-in-law, and he appointed his uncle Joseph to govern in his absence, charging him to put the queen to death, if his trial should prove fatal to him, as he could not support the idea of her falling into the possession of another.

Herod received a visit from Cleopatra, who is reported to have had amorous intentions with regard to him, which he prudently disappointed, for fear of the vengeance of Antony; but he fully satisfied her avarice with the most ample donations. When hostilities commenced between Antony and Octavius, he raised an army to join the former, but had first to contend with

Herod.

Malchus, king of part of Arabia, whom he defeated, and compelled to sue for peace. After the battle of Actium, he resolved to make terms with the victor, to prepare for which he put the aged Hyrcan to death, and embarked for Rhodes, where Augustus at that time was. He appeared before the emperor in all the insignia of royalty except his diadem, boldly relating all the services he had performed to his benefactor Antony, and observed that he was willing to transfer the same gratitude to a new patron, from whom he might hold his crown and kingdom.

Augustus was struck with the magnanimity of this defence, and replaced the diadem on his head. When Augustus passed through Syria in his way to and from Egypt, he was magnificently entertained by Herod, for which he restored him the whole of his dominions, and even enlarged them. Before his interview with Augustus, Herod had given a second order respecting the murder of Mariamne; and growing jealous of Sohemus, her last guardian, he soon after had her condemned and executed, in spite of the solemn protestations of her innocence. His remorse on this occasion was dreadful, and no scenes of riot and debauchery could banish her from his mind. He would frequently call aloud upon her name, and ordered his attendants to bring her into his presence, as if unwilling to forget that she was no more. He built a theatre and amphitheatre at Jerusalem, for the purpose of celebrating games in honour of Augustus, which exasperated the Jews to such a degree, that a conspiracy was formed against him, and on the detection of it, the principal contrivers were punished with a merciless severity.

He built several strong fortresses in different parts of Judea for his own security, one of which, in honour of the emperor, was denominated Cæsarea. To supply in some measure the loss of Mariamne, he married another lady of the same name, the beautiful daughter of a priest, whom he raised to the supreme pontificate. He was in such favour with Augustus, that he was appointed imperial procurator of Syria, and obtained a tetrarchy for his brother. To conciliate the favour of the Jews, he undertook the vast work of rebuilding the temple of Jerusalem, and by constantly employing a whole army of workmen for a year and a half, this magnificent edifice was completed. In the course of another visit to the emperor, Herod obtained new favours, particularly a grant of half the produce of the mines of Cyprus, and the overseership of the rest. After this he dedicated his new city of Cæsarea, when he exhibited so much profuse magnificence, that Augustus said, his soul was too great for his kingdom. He procured the condemnation and the death of his two sons by the first Mariamne, for which he has been bitterly accused; but when we recollect that he took the greatest care of the two sons whom each left behind him, we must conclude that there was more reason for their punishment than some are willing to allow. The charge brought against them was an unnatural conspiracy against his life and crown, and it seems to have been fairly substantiated. His ungrateful brother Pheroras, and his favoured son Antipater conspired against him. Soon after the discovery of it the former died, and the latter went to Rome.

The birth of Christ happened in the 33d year of his reign, which is said to have been soon followed by that act of barbarous cruelty, the massacre of the children of Bethlehem, instigated by jealousy of this king of the Jews in a spiritual sense, of whose birth he obtained information from the magi. It is to be observed that the account of this deed is no where to be met with but in St Matthew's gospel, for while Josephus seems to dwell with studied minuteness on the cruelties of Herod, he gives not a single hint respecting this massacre. As Antipater was returning from Rome, he was arrested by his father's orders, tried and condemned for treasonable practices. These calamities, joined to a shattered constitution, threw Herod into a loathsome distemper, accompanied with remarkable symptoms, which has sometimes been considered as a judgment from heaven. He ordered the sentence against Antipater to be put in execution, and appointed his son Archelaus to succeed him on the throne. According to Josephus, he collected together at Jericho the chief persons among the Jews, where he ordered them to be shut up in the circus, giving strict orders to his sister Salome to have them all massacred as soon as he breathed his last. This order was never executed, but we very much doubt the veracity of Josephus whether it was ever given. The most bloody monster that ever existed, was chiefly pleased with such acts of cruelty as he could either perform in person, witness by the agency of his slaves, or know to be done during his lifetime; but this supposed posthumous cruelty of Herod is wholly unaccountable. If it was actually the case, we can account for it upon no principles of human depravity, and it is wholly *unique* in the annals of tyranny.

His remains were interred with great pomp and magnificence; and although his memory has been consigned to detestation and abhorrence, his great talents and the glories of his reign, conspire to assign him a distinguished place in the list of sovereigns.

Herod || Herodians.

HERODIAN, an eminent Greek historian, who spent the greatest part of his life at Rome, flourished in the third century, in the reigns of Severus, Caracalla, Heliogabalus, Alexander, and Maximin. His history begins from the death of Marcus Aurelius the Philosopher; and ends with the death of Balbinus and Maximin, and the beginning of the reign of Gordian. It is written in very elegant Greek; and there is an excellent translation of it into Latin, by Angelus Politianus. Herodian has been published by Henry Stephens in 4to, in 1581; by Boecler, at Strasburg, in 1662, 8vo; and by Hudson, at Oxford, in 1699, 8vo.

HERODIANS, a sect among the Jews at the time of our Saviour: mentioned Matth. xxii. 16. Mark iii. 6.

The critics and commentators are very much divided with regard to the Herodians. St Jerome, in his Dialogue against the Luciferians, takes the name to have been given to such as owned Herod for the Messiah; and Tertullian and Epiphanius are of the same opinion. But the same Jerome, in his Comment on St Matthew, treats this opinion as ridiculous; and maintains, that the Pharisees gave this appellation by way of ridicule to Herod's soldiers who paid tribute to the Romans; agreeable to which the Syrian interpreters render the word by *the domestics of Herod*, i. e. "his courtiers." M. Simon, in his notes on the 22d chapter of Matthew, advances a more probable opinion.

The

Herodotus.

The name *Herodian* he imagines to have been given to such as adhered to Herod's party and interest; and were for preserving the government in his family, about which were great divisions among the Jews.—F. Hardouin will have the Herodians and Sadducees to have been the same.—Dr Prideaux is of opinion that they derived their name from Herod the Great, and that they were distinguished from the other Jews by their concurrence with Herod's scheme of subjecting himself and his dominions to the Romans, and likewise by complying with many of their heathen usages and customs. This symbolizing with idolatry upon views of interest and worldly policy, was probably that leaven of Herod, against which our Saviour cautioned his disciples. It is farther probable that they were chiefly of the sect of Sadducees; because the leaven of Herod is also denominated the leaven of the Sadducees.

HERODOTUS, an ancient Greek historian of Halicarnassus in Caria, son of Lyxus and Dryo, was born in the first year of the 74th Olympiad, that is, about 484 B. C. The city of Halicarnassus being at that time under the tyranny of Lygdamis grandson of Artemisia queen of Caria, Herodotus quitted his country and retired to Samos; from whence he travelled over Egypt, Greece, Italy, &c. and in his travels acquired the knowledge of the history and origin of many nations. He then began to digest the materials he had collected into order, and composed that history which has preserved his name among men ever since. He wrote it in the isle of Samos, according to the general opinion.—Lucian informs us, that when Herodotus left Caria to go into Greece, he began to consider with himself

What he should do to be for ever known,
And make the age to come his own,

in the most expeditious way, and with as little trouble as possible. His history, he presumed, would easily procure him fame, and raise his name among the Grecians in whose favour it was written: but then he foresaw that it would be very tedious to go through the several cities of Greece, and recite it to each respective city; to the Athenians, Corinthians, Argives, Lacedemonians, &c. He thought it most proper therefore to take the opportunity of their assembling all together; and accordingly recited his work at the Olympic games, which rendered him more famous than even those who had obtained the prizes. None were ignorant of his name, nor was there a single person in Greece who had not seen him at the Olympic games, or heard those speak of him who had seen him there.

His work is divided into nine books; which according to the computation of Dionysius Halicarnassensis, contain the most remarkable occurrences within a period of 240 years; from the reign of Cyrus the first king of Persia, to that of Xerxes when the historian was living. These nine books are called after the names of the nine muses, each book being distinguished by the name of a muse; and this has given birth to two disquisitions among the learned: 1. Whether they were so called by Herodotus himself; and, 2. For what reason they were so called. As to the first, it is generally agreed that Herodotus did not impose these names himself; but it is not agreed why they were imposed by others. Lucian tells us, that these names were given them by the Grecians at the Olympic games, when they were first recited, as the best compliment that could be paid the man who had taken pains to do them so much honour. Others have thought that the names of the *muses* have been fixed upon them by way of reproach; and were designed to intimate, that Herodotus, instead of true history, had written a great deal of fable. But, be this as it will, it is certain, that with regard to the truth of his history, he is accused by several authors; and, on the other hand, he has not wanted persons to defend him. Aldus Manutius, Joachim Camerarius, and Henry Stephens, have written apologies for him; and, among other things, have very justly observed, that he seldom relates any thing of doubtful credit without producing the authority on which his narration is founded; and, if he has no certain authority to fix it upon, uses always the terms *ut ferunt*, *ut ego audivi*, &c.

Heroic || Heron.

There is ascribed also to Herodotus, but falsely, a Life of Homer, which is usually printed at the end of his work.—He wrote in the Ionic dialect, and his style and manner have ever been admired by all people of taste. There have been several editions of the works of this historian; two by Henry Stephens, one in 1570, and the other in 1592; one by Gale at London in 1679; and one by Gronovius at Leyden in 1715, which is the last and best, though not the best printed.

HEROIC, something belonging to a hero, or heroine. Thus we say, *heroic* actions, *heroic* virtue, *heroic* style, *heroic* verse, *heroic* poet, *heroic* age, &c.

Heroic Age, is that age or period of the world wherein the *heroes*, or those called by the poets the *children of the gods*, are supposed to have lived.—The heroic age coincides with the fabulous age.

Heroic Poem, is that which undertakes to describe some extraordinary action or enterprise. Homer, Virgil, Statius, Lucan, Tasso, Camoens, Milton, and Voltaire, have composed *heroic poems*. In this sense, *heroic poem* coincides with *epic poem*.

Heroic Verse, is that wherein heroic poems are usually composed; or, it is that proper for such poems. In the Greek and Latin, hexameter verses are peculiarly denominated *heroic verses*, as being alone used by Homer, Virgil, &c. Alexandrine verses, of 12 syllables, were formerly called *heroic verses*, as being supposed the only verse proper for heroic poetry; but later writers use verses of ten syllables.

HEROINE, Heroina, or *Herois*, a woman that has the qualities and virtues of a hero, or that has done some heroic action.

HERON. See Ardea, Ornithology *Index*.

This bird is a very great devourer of fish, and will do more mischief to a pond than even an otter. Some say that an heron will destroy more fish in a week than an otter will in three months; but that seems carrying the matter too far. People who have kept herons, have had the curiosity to number out the fish they fed them with into a tub of water; and counting them again afterwards, it has been found that a heron will eat 50 moderate-sized dace and roaches in a day. It has been found, that in carp-ponds visited by this bird, one heron will eat up 1000 store carp in a year, and

will

Herpes || Herring.

will hunt them ſo cloſe that very few can eſcape. The readieſt method of deſtroying this miſchievous bird is by fiſhing for him in the manner of pike, with a baited hook; the bait conſiſting of ſmall roach or dace, and the hook faſtened to one end of a ſtrong line, made of ſilk and wire twiſted together. To the other end of the line is faſtened a ſtone of a pound weight; and ſeveral of theſe baited lines being ſunk by means of the ſtone in different parts of the pond, in a night or two the heron will not fail of being taken by one or other of them.

HERPES, in *Medicine*, a bilious puſtule, which breaking out in different manners upon the ſkin, accordingly receives different denominations. See MEDICINE *Index*.

HERRERA TORDESILLAS, ANTHONY, a Spaniſh hiſtorian, the ſon of Roderic de Tordeſillas and Agnes de Herrera, it being the cuſtom of that country to bear the mother's name, was born in 1565. He was ſecretary to Veſpaſian de Gonzaga, viceroy of Navarre and Valentia, and afterwards appointed royal hiſtoriographer for the Indies by Philip II. to which a liberal penſion was attached. While he held this office, he wrote his general hiſtory of the Indies in 4 vols folio, comprehending the whole of the Spaniſh tranſactions there, from 1492 to 1554. The celebrated Scottiſh hiſtorian Dr Robertſon, ſays of it, that it "furniſhes the fulleſt and moſt accurate information concerning the conqueſt of Mexico, as well as every other tranſaction of America. The induſtry and attention with which he conſulted not only the books, but the original and public records, were ſo great, and he uſually judges of the evidence before him with ſo much impartiality and candour, that his decads may be ranked among the moſt judicious and uſeful hiſtorical collections." Herrera likewiſe compoſed a general hiſtory of his own time, from 1554 to 1598, which is not ſo much admired. His death, which happened in 1625, prevented him from enjoying the office of ſecretary of ſtate, which Philip IV. deſigned for him on the very firſt vacancy.

HERRERA, *Ferdinand de*, a Spaniſh poet of the 16th century, was a native of Seville. In the year 1582, he publiſhed a collection of poems of the lyric and heroic ſpecies, which were reprinted in 1619. By theſe he obtained a conſiderable reputation as a favourite of the muſes, and made him be regarded as the firſt lyric poet belonging to Spain. As to his ſtyle, it is generally allowed to be neat, elegant, copious, and correct. He likewiſe publiſhed an edition of Garcilaſſo de la Vega, with notes; a narrative of the war of Cyprus, and of the battle of Lepanto.

HERRING, in *Ichthyology*, a ſpecies of CLUPEA.

The name *herring* is derived from the German *heer*, an *army*, which expreſſes their number, when they migrate into our ſeas. Herrings are found in great plenty from the higheſt northern latitudes as low as the northern coaſts of France. They are alſo met with in vaſt ſhoals on the coaſt of America, as low as Carolina: they are found alſo in the ſea of Kamtſchatka, and poſſibly reach Japan: but their winter rendezvous is within the arctic circle, whither they retire after ſpawning, and where they are provided with plenty of inſect food. For an account of the remarkable migration of herrings, and the hiſtory of the fiſhery, &c. ſee CLUPEA and *Herring*-FISHERY.

Herring.

They are in full roe at the end of June, and continue in perfection till the beginning of winter, when they begin to depoſit their ſpawn.

There are different names given to preſerved herrings, according to the different manners wherein they are ordered: as, 1. *Sea-ſticks;* which are ſuch as are caught all the fiſhing ſeaſon, and are but once packed. A barrel of theſe holds ſix or eight hundred; eight barrels go to the ton by law; a hundred of herrings is to be a hundred and twenty; a laſt is ten thouſand; and they commonly reckon fourteen barrels to the laſt. 2. There are others, repacked on ſhore, called *repacked herrings;* ſeventeen barrels of ſea-ſticks commonly make from twelve to fourteen of repacked herrings. The manner of repacking them is, to take out the herrings, waſh them out in their own pickle, and lay them orderly in a freſh barrel: theſe have no ſalt put to them, but are cloſe packed, and headed up by a ſworn cooper, with pickle, when the barrel is half full. The pickle is brine; ſo ſtrong as that the herring will ſwim in it. 3. *Summers*, are ſuch as the Dutch chaſers or divers catch from June to the 15th of July. Theſe are ſold away in ſea-ſticks, to be ſpent preſently, in regard of their fatneſs; becauſe they will not endure repacking. They go one with another, full and ſhotten; but the repacked herrings are ſorted, the full herrings by themſelves. 4. The *ſhotten* and *ſick herrings* by themſelves; the barrel whereof is to be marked diſtinctly. 5. *Crux herrings;* which are ſuch as are caught after the 14th of September. Theſe are cured with that kind of ſalt called ſalt upon ſalt, and are carefully ſorted out, all full herrings, and uſed in the repacking. 6. *Corved herrings*. Theſe ſerve to make red herrings, being ſuch as are taken in the Yarmouth ſeas, from the end of Auguſt to the middle of October; provided they can be carried aſhore within a week, more or leſs, after they are taken. Theſe are never gipped but rowed in ſalt, for the better preſerving of them, till they can be brought on ſhore; and ſuch as are kept to make *red herrings* are waſhed in great vats in freſh water, before they are hung up in the *herring-hangs* or *red-herring* houſes.

As for the *manner of ſalting herrings*. The nets being haled on board, the fiſhes are taken out, and put into the warbacks, which ſtand on one ſide of the veſſels. When all the nets are thus unloaded, one fills the gippers baſkets. The gippers cut their throats, take out their guts, and fling out the full herrings into one baſket, and the ſhotten into another. One man takes the full baſket when they are gipped, and carries them to the rower-back, wherein there is ſalt. One boy rows and ſtirs them about in the ſalt, and another takes them, thus rowed, and carries them in baſkets to the packers. Four men pack the herrings into one barrel, and lay them, one by one, ſtraight and even; and another man, when the barrel is full, takes it from the packers. It is left to ſtand a day, or more, open to ſettle, that the ſalt may melt and diſſolve to pickle; after which it is filled up, and the barrel headed. The pickle is to be ſtrong enough to ſuſtain a herring; otherwiſe the fiſh decay in it.

HERRING, *Thomas*, archbiſhop of Canterbury, memorable for his attachment to civil and religious liberty, was the ſon of a clergyman, and born in the year 1693. He received his grammar-ſchool education at

Wiſbech

Herring.

Wiſbech in the iſle of Ely; and at the age of 17 was ſent to Jeſus college in the univerſity of Cambridge, at which place he was made B. A. in 1714, and the title or degree of A. M. was conferred upon him about three years afterwards. In the year 1722, he was appointed chaplain to Dr Fleetwood, biſhop of Ely, who gave him two rectories; and in 1726 he was nominated preacher to the honourable ſociety of Lincoln's Inn. He was choſen chaplain in ordinary to his majeſty about the ſame period, and obtained from Cambridge the degree of D. D. in the year 1728. Biſhop Fleetwood, his worthy patron, declared to his friends, that he never heard a ſermon from Dr Herring which he would not have been proud to be the author of himſelf. In 1731, he was choſen rector of Blechingley in Surrey; the ſame year appointed dean of Rocheſter, and the king promoted him to the ſee of Bangor in the year 1737. He was appointed archbiſhop of York in 1743; and it was peculiarly fortunate for the country at that critical juncture, that a man of his principles and public ſpirit was raiſed to ſuch an exalted rank. The rebellion in Scotland was ſo artfully concealed by its friends in England, that it was ſcarcely believed the Highlanders were in arms, till the royaliſts were defeated at the battle of Preſtonpans. Amidſt the univerſal conſternation which this event occaſioned, Archbiſhop Herring rouſed the people to a ſenſe of their danger, contributed to remove the panic, and encouraged them to unite with firmneſs and vigour in the defence of their country.

A meeting of the nobility, gentry, and clergy, was held at York, where the archbiſhop addreſſed them in a very able and animated ſpeech, requeſting them to unite as one man in averting the preſent danger, to preſerve their happy conſtitution, and contribute to a ſubſcription for raiſing troops in defence of the country. The whole aſſembly entered warmly into his views, and immediately ſubſcribed about 40,000l. for the important purpoſe recommended by his grace. On the death of Archbiſhop Potter, which happened in 1747, Dr Herring was tranſlated to the ſee of Canterbury. In 1753 he was ſeized with a violent fever, which brought him to the verge of the grave; and although he ſo far recovered that he languiſhed for a few years, yet his ſtrength and ſpirits were very much exhauſted, and he expired in 1756, in the 63d year of his age. He was buried, according to his own deſire, without any pomp or parade, and no monument was erected to his memory.

We are informed by Mr Duncombe, that the archbiſhop's perſon was tall and comely; his conſtitution, from his tendereſt youth, weak and delicate; his addreſs eaſy, engaging, and polite. He was generous without prodigality, magnificent without profuſion, and humble without meanneſs. In his life-time he could never be prevailed upon to publiſh any of his ſermons; but after his death Mr Duncombe publiſhed ſeven ſermons on public occaſions, in one volume octavo, giving in the preface ſome account of the author's life. In the Monthly Review he was termed "a prelate of uncommon virtues, a man of extraordinary accompliſhments, a candid divine, a polite ſcholar, a warm lover of his country, a true friend to liberty, religious as well as civil, and of courſe, a moſt ſincere hater of perſecution."

Herrnhut.

HERRNHUT, or HERRNHUTH, the firſt and moſt conſiderable ſettlement of the United Brethren, commonly called *Moravians*, ſituated in Upper Luſatia, upon an eſtate, belonging to the family of Nicolas Lewis Count Zinzendorf, about 50 miles eaſt of Dreſden. See the article UNITED *Brethren*.

The building of this place was begun in 1727 by ſome emigrants from Moravia, who forſook their poſſeſſions on account of the perſecution they ſuffered as Proteſtants from the Roman Catholics; and being well received by Count Zinzendorf, cleared a ſpot of ground allotted to them by him upon the riſe of an hill called the *Hutberg*, or Watch-hill, from which they took occaſion to call the new ſettlement *Herrnhut*, or the Watch of the Lord. More emigrants taking refuge with them, and many other perſons joining their congregation, the buildings increaſed conſiderably; and at preſent Herrnhut is a regular and well-built village, containing about 1300 inhabitants, all members of the Church of the United Brethren. Beſides the miniſter and his aſſiſtants, a warden is appointed, who preſides in the veſtry, and ſuperintends the temporal concerns of the ſettlement. The Brethren diſtinguiſh themſelves by a plain and uniform dreſs, the women having retained the dreſs of the countries from which the firſt emigrants proceeded, not from any ſuperſtitious attachment to old forms, but from a deſire to preclude vanity and uſeleſs expence. As moſt of the ſettlements of this community reſemble each other, both in the diſpoſition of their buildings and in their internal regulations, we will give a ſhort ſketch of Herrnhut, as the pattern from which the reſt were copied, though there are others in which the buildings are more regularly planned. The chapel, which is ſituated in a large ſquare, is a ſpacious and neat building, furniſhed with a good organ and moveable forms, but no pews. The men ſit on one ſide, and the women on the other, entering at ſeparate doors. Beſides the uſual Sunday's ſervice, the congregation meets here every evening and the children every morning. The dwellings of the miniſter and warden of the congregation form one, and a ſchool-houſe the other, wing to the chapel. From the chapel an avenue of trees leads to the burying-ground, which is a large ſquare field on the declivity of the Hutberg, and at ſome diſtance from the village. Several walks bordered by trees, and furniſhed with ſeats, ſurround and interſect it. The grave-ſtones and graves are all of equal ſize, and placed in regular rows; only the vault of Count Zinzendorf, as lord of the manor, is larger than the reſt. Burials are performed with great ſolemnity, but no mourning dreſſes uſed.—On one ſide of the ſquare, in which the chapel ſtands, is a large building, inhabited by the ſingle men, with workſhops, outhouſes, and gardens, excluſive of the dwelling rooms. The main building contains a neat chapel, in which a ſhort morning and evening ſervice is performed for the inhabitants; a dining-hall; and a dormitory, in which each has a ſeparate bed. The latter is a lofty room, furniſhed with large windows and ventilators, ſo as to admit and preſerve a pure air. For the ſick, apartments are allotted, and ſick waiters appointed. The number of inhabitants in one room is proportioned to its ſize, but there are many who have rooms to themſelves. No one lives here by compulſion. Each inhabitant pays for rent and board a moderate ſum, fixed

by

by a committee of overfeers, in which the warden of the houfe prefides; whofe bufinefs it is to maintain good order, attend to the external welfare of the houfe and its inhabitants, and by his advice and activity to prevent every evil arifing from external fources. Befides the warden, an unmarried clergyman refides in the houfe, appointed to attend to the moral conduct and fpiritual concerns of all the fingle men belonging to the congregation. He hears their complaints, affifts them with good advice, and ufes all his influence for their benefit, and for the prevention of any evil that would undermine their fpiritual happinefs.—On the other fide of the fquare is another large building, inhabited by fingle women; with a chapel, dining hall, dormitory, and a large garden. The internal regulations are exactly the fame with thofe of the houfe of the fingle men. There are likewife houfes for widowers and widows, who find in them an agreeable retreat, with board and lodging. The poor are cared for and maintained; for which purpofe feveral charitable inftitutions exift in the congregation.—The manor-houfe, the houfe of Count Reufs, the fhop and linen warehoufe, are the moft confiderable buildings in Herrnhut; the family houfes are built in regular ftreets, opening into the fquare. Both the ftreets and houfes are kept clean; and befides a watchman at night, an officer is appointed to attend to good order in the day. All ftrangers are treated with civility; but neither drunken nor diforderly vifitors nor beggars are fuffered to infeft the ftreets. The latter receive an alms, and are then defired to proceed. The principal trade carried on at Herrnhut is in linen; befides which the work done there by taylors, glovers, fhoemakers, cabinet-makers, filverfmiths, and other artificers, is well known for its good quality. They have their firft prices, and never make any abatement. Every workman receives his wages; no community of goods exifting among the brethren, as is falfely fuppofed; and the contributions towards the fupport of the eftablifhment at large, the miffions, and other charitable inftitutions, are voluntary. The building and increafe of this fettlement occafioned no fmall furprife in the adjacent country; and both in 1732, 1736, and 1737, commiffioners were appointed to examine into the doctrines and proceedings of the brethren at Herrnhut. The commiffioners made a favourable report; and ever fince both Herrnhut and other fettlements of the United Brethren in Saxony have been protected, and even feveral immunities offered them by the court, but not accepted. Herrnhut was vifited in 1766 by the late emperor Jofeph II. after his return from Drefden, by the prefent king of Pruffia, and by feveral other royal perfonages, who expreffed their fatisfaction in examining its peculiar regulations. The United Brethren have fettlements in Saxony, Silefia, and other parts of Germany; in Holland, Denmark, England, Ireland, and America. In England, their principal fettlements are at Fulnec near Leeds, and Fairfield near Manchefter. In Greenland, North and South America, the Weft Indies, and Ruffia, they have miffions for the propagation of Chriftianity among the heathen; and in many parts have had confiderable fuccefs. See *Bufching's Account of the Rife and Progrefs of the Church of the Brethren*, Halle 1781; and *Crantz's Hiftory of the Brethren*, London 1780.

Herrnhut, *New*, the firft miffion fettlement of the United Brethren, in the ifland of St Thomas in the Weft Indies, under the Danifh government, begun in 1739; their miffionaries having endeavoured to propagate Chriftianity among the negro flaves ever fince 1731, and fuffered many hardfhips and perfecutions, from which their converts were not exempted. Many of the planters finding in procefs of time that the Chriftian flaves were more tractable, moral, and induftrious, than the heathen, not only countenanced but encouraged their endeavours. Thefe were alfo greatly facilitated by the protection of the king of Denmark. The fettlement confifts of a fpacious negro church, a dwelling-houfe for the miffionaries, negro-huts, out-houfes, and gardens. From this place the iflands of St Croix and St Jan were at firft fupplied with miffionaries; and the Brethren have now two fettlements in each. The negro converts belonging to their church amount in thofe three iflands to near eight thoufand fouls.

Herrnhut, *New*, is alfo the name of the oldeft miffion fettlement of the United Brethren in Greenland. It is fituated on Balls River, a few miles from the fea, near Davis's Straits, on the weftern coaft of Greenland, not far from the Danifh colony Godhaab. The two firft miffionaries were fent from Herrnhut in the year 1733, and their laudable intentions were favoured by the king of Denmark. They had to ftruggle in this uncultivated, frozen, and favage country, with inconceivable hardfhips, and found at firft great difficulty in acquiring the language of the natives. However, after fix years labour and perfeverance, they had the fatisfaction to baptize four perfons, all of one family: and from that time the miffion began to profper, fo that in the fucceeding years two other fettlements were begun, called Lichtenfels and Lichtenau: All of them continue in profperity. About 1300 of the natives have been chriftianized fince the beginning of this miffion. See *Crantz's Hiftory of Greenland*, London, 1777.

HERSCHEL, the name by which the French, and moft other European nations, call the planet difcovered by Dr Herfchel in the year 1781. The Italians call it Uranos, and the Britifh, Georgium Sidus.

HERSE, in *Fortification*, a lattice, or portcullis, in form of a harrow, befet with iron fpikes. The word *herfe* is French, and literally fignifies "harrow;" being formed of the Latin *herpex* or *irpex*, which denotes the fame. It is ufually hung by a rope faftened to a moulinet; to be cut, in cafe of furprife, or when the firft gate is broken with a petard, that the herfe may fall, and ftop up the paffage of the gate or other entrance of a fortrefs.

The herfe is otherwife called a *farrafin*, or *cataract*; and when it confifts of ftraight ftakes, without any crofs-pieces, it is called *orgues*.

Herse, is alfo a harrow, which the befieged, for want of chevaux de frife, lay in the way, or in breaches, with the points up, to incommode the march as well of the horfe as of the infantry.

HERSILLON, in the military art, a fort of plank or beam, ten or twelve feet long, whofe two fides are driven full of fpikes or nails, to incommode the march of the infantry or cavalry. The word is a diminutive of *herfe*; the herfillon doing the office of a little herfe. See Herse.

HERTFORD. See HARTFORD.—In the account given of this county under the latter name, it was omitted to mention that the East India Company had established a college in it, where persons are to be properly qualified for filling places of trust and importance in the government of India. It is composed of a school, into which boys may be admitted at an early age, and a college for students, 15 years old, in which they are to continue till they have completed their 18th year, or till the directors send them to their particular destinations. In the school, the chief intention is to qualify them for public business, and the first departments of commercial life. The students of the college are to hear public lectures, similar to those which are delivered in the universities. The means of instructing them in the elements of oriental literature will also be attended to, for which purpose they will be taught the rudiments of the Asiatic, Arabic, and Persian languages, and the history, customs, and manners of the eastern nations, as well as the political and commercial relations subsisting between Great Britain and India.

The college is to be under the authority of a principal and seven professors, besides a French master, a drawing-master, a fencing-master, and other suitable instructors.

The principal is required to preach in the college chapel, in rotation with such of the professors as are in holy orders, and to bear his part in performing the other functions of religious worship.

The lectures of the professors are to be arranged under the following heads; viz. oriental literature; mathematics and natural philosophy; classical and general literature; law, history, and political economy.

It is proposed to divide the college year into two terms of 20 weeks each, and the last week of each term is to be dedicated to the examination of the students. A list of their names who are found to have made the greatest proficiency, will be transmitted to the court of directors, who will reward merit in such a manner as may be agreed upon by the college committee. The utmost attention will be paid to their moral and religious instruction, comprehending an account of the evidences, doctrines, and duties of divine revelation.

The college and school were opened on the 3d of February 1806, for the reception of students and pupils. The master of the school is to receive 70 guineas annually, without any additional charge, and students are to pay 50 guineas to the company at the commencement of each term, for which they will receive every accommodation except a few articles of private convenience. Every kind of extravagant expence is to be discouraged.

HERTHA, or HERTHUS, in *Mythology*, a deity worshipped by the ancient Germans. This is mentioned by Tacitus, in his book *De Moribus Germanorum*, cap. 40. Vossius conjectures, that this goddess was Cybele: but she was more probably Terra or the Earth; because the Germans still use the word *hert* for the earth, whence also the English *earth*.

HERTZBERG, a considerable town of Germany, in the electorate of Saxony, and on the confines of Lusatia. E. Long. 13. 37. N. Lat. 51. 42.

HERVEY, JAMES, a pious and ingenious divine of the church of England in the 18th century, a writer of very great popularity among people of the Calvinistic persuasion, was born at Hardingstone in the year 1714. He was educated at the free grammar-school of Northampton, where he acquired a competent knowledge of the Greek and Latin languages; and in 1731 he was sent to the university of Oxford. The first two or three years of his residence at that seminary were spent, we are told, without much application to study, and therefore without making much improvement; but afterwards becoming acquainted with those who zealously studied what they called *primitive Christianity*, afterwards termed *Methodists*, he became strongly attached both to piety and learning. Independent of his other studies, he learned anatomy from Dr Keil, and natural philosophy from Dr Derham's Physico and Astrotheology; and by the perusal of Mr Spence's essay on Pope's Odyssey he improved his style. He attempted the Hebrew language without a teacher, and after relinquishing the study of it in despair, he resumed his labours, and became a tolerable proficient in that forbidding language.

In the year 1740 he was curate of Biddeford in Devonshire, where he had only 60l. a-year, including a stated collection made by his friends. On the death of the rector he was dismissed by the new incumbent, contrary to the earnest expostulation of the parishioners, who offered to maintain him independent of the rector. In 1743 he became curate to his father, who held the living of Weston-Favell in Northamptonshire, and continued in that station till 1750, when his health was rapidly declining, from his intense application to study, and a constitution naturally delicate. Having been artfully decoyed to London for a change of air, he continued about two years in that metropolis, and was soon recalled to Weston-Favell to succeed his father. He got both the livings of Weston and Collingtree in the same neighbourhood, and in 1752 was made M. A. He attended to the duties of both parishes alternately with a curate, in the discharge of which he was fervent and indefatigable. He seldom made use of notes in the pulpit, and constantly catechised the children of his parishioners, nor did he neglect his pastoral visitations at their own houses. So great were his exertions, that he brought on a decline, accompanied with an incessant cough and acute pains, all which he supported, not only with fortitude, but without a single expression of peevishness.

He died without a groan on the 25th of December 1758, about 44 years of age. His piety was ardent and sincere, although in the estimation of good judges he was rather enthusiastic. He was unquestionably a man of the most unblemished moral deportment; his temper was disinterested, and he was truly humble without affectation. To society he was just and punctual, and candid to people of every description. The 700l. which he received for his Meditations, were applied to the relief of the indigent and distressed. He was such a rigid Calvinist that he was almost an antinomian, whenever he spoke of imputed righteousness. His erudition was respectable, but not such as to place him among scholars of the first rank, although he seems to have been master of the classics. Many have admired the style of his writings, but a judge must certainly pronounce it by far too diffuse to be termed elegant, for it is neither chaste, manly, nor nervous.

Besides

Besides his Meditations, he published remarks on Lord Bolingbroke's letters on the use and study of history, so far as they relate to the history of the Old Testament; Theron and Aspasio; Aspasio Vindicated, and Sermons on the Trinity, &c. published from his own MSS. after his death.

Hervey-Island, one of the South Sea islands discovered by Captain Cook, September 23. 1773, who gave it that name in honour of the earl of Bristol. It is a low island, situated in W. Long. 158. 54. S. Lat. 19. 8.

HESBON, Esebon, or *Hesebon*, in *Ancient Geography*, the royal city of the Amorites, in the tribe of Reuben, according to Moses: Though in Joshua xxi. 39. where it is reckoned among the Levitical cities, it is put in the tribe of Gad; which argues its situation to be on the confines of both.

HESIOD, a very ancient Greek poet; but whether cotemporary with Homer, or a little older or younger than him, is not yet agreed among the learned; nor is there light enough in antiquity to settle the matter exactly. His father, as he tells us in his *Opera et Dies*, was an inhabitant of Cuma, one of the Eolian isles, now called *Taio Nova;* and removed from thence to Ascra, a little village of Bœotia, at the foot of Mount Helicon, where Hesiod was probably born, and called, as he often is, *Ascræus*, from it. Of what quality his father was, is nowhere said; but that he was driven by his misfortunes from Cumæ to Ascra, Hesiod himself informs us. His father seems to have prospered better at Ascra than he did in his own country; yet Hesiod could arrive at no higher fortune than keeping sheep on the top of Mount Helicon. Here the muses met with him, and entered him into their service:

Erewhile as they the shepherd swain behold,
Feeding beneath the sacred mount his fold,
With love of charming song his breast they fir'd,
There me the heav'nly muses first inspir'd;
There, when the maids of Jove the silence broke,
To Hesiod thus, the shepherd swain they spoke, &c.

To this account, which is to be found in the beginning of his *Generatio Deorum*, Ovid alludes in these two lines:

Nec mihi sunt visæ Clio, Cliusque sorores,
Servanti pecudes vallibus Ascra tuis.
Nor Clio nor her sisters have I seen,
As Hesiod saw them in the Ascræan green.

On the death of the father, an estate was left, which ought to have been equally divided between the two brothers Hesiod and Perses; but Perses defrauded him in the division, by corrupting the judges. Hesiod was so far from resenting this injustice, that he expresses a concern for those mistaken mortals who place their happiness in riches only, even at the expence of their virtue. He lets us know, that he was not only above want, but capable of assisting his brother in time of need; which he often did though he had been so ill used by him. The last circumstance he mentions relating to himself is his conquest in a poetical contention. Archidamus, king of Eubœa, had instituted funeral games in honour of his own memory, which his sons afterwards took care to have performed. Here Hesiod was a competitor for the prize in poetry; and won a tripod, which he consecrated to the muses. Hesiod having entered himself in the service of the muses, left off the pastoral life, and applied himself to the study of arts and learning. When he was grown old, for it is agreed by all that he lived to a very great age, he removed to Locris, a town about the same distance from Mount Parnassus as Ascra was from Helicon. His death was tragical. The man with whom he lived at Locris, a Milesian born, ravished a maid in the same house; and though Hesiod was entirely ignorant of the fact, yet being maliciously accused to her brothers as an accomplice, he was injuriously slain with the ravisher, and thrown into the sea. The *Theogony*, and *Works and Days*, are the only undoubted pieces of this poet now extant: though it is supposed that these poems have not descended perfect and finished to the present time. A good edition of Hesiod's works was published by Mr Le Clerc at Amsterdam in 1701.

HESPER, Hesperus, in *Astronomy*, the evening star; an appellation given to Venus when she follows or sets after the sun. The word is formed of the Greek Ἑσπερος; and is supposed to have been originally the proper name of a man, brother of Atlas, and father of the Hesperides.

Diodorus, lib. iii. relates, that Hesperus having ascended to the top of Mount Atlas, the better to observe and contemplate the stars, never returned more; and that hence he was fabled to have been changed into this star.

HESPERIA, an ancient name of Italy; so called by the Greeks from its western situation. *Hesperia* was also an appellation of Spain; but with the epithet *ultima* (Horace), to distinguish it from Italy, which is called *Hesperia magna* (Virgil), from its extent of empire.

HESPERI cornu, called the *Great Bay* by the author of Hanno's Periplus; but most interpreters, following Mela, understand a promontory; some Cape Verd, others Palmas Cape: Vossius takes it to be the former, since Hanno did not proceed so far as the latter cape.

HESPERIDEÆ, in *Botany* (from the Hesperides); *golden* or *precious fruit:* the name of the 19th order in Linnæus's Fragments of a Natural Method. See Botany.

HESPERIDES, in the ancient mythology, were the daughters of Hesper or Hesperus, the brother of Atlas. According to Diodorus, Hesperus and Atlas were two brothers who possessed great riches in the western parts of Africa. Hesperus had a daughter called Hesperia, who married her uncle Atlas, and from this marriage proceeded seven daughters, called *Hesperides* from the name of their mother, and *Atlantides* from that of their father. According to the poets, the *Hesperides* were three in number, Ægle, Arethusa, and Hesperthusa. Hesiod, in his Theogony, makes them the daughters of *Nox*, Night, and seats them in the same place with the Gorgons; viz. at the extremities of the west, near Mount Atlas: it is on that account he makes them the daughters of Night, because the sun sets there. The Hesperides are represented by the ancients as having the keeping of certain golden apples, on the other side the ocean. And the poets give them a dragon to watch the garden where the fruit grows; this dragon they tell us Hercules slew, and carried off the

Hesperides || Hesse.

the apples.—Pliny and Solinus will have the dragon to be no other than an arm of the sea, wherewith the garden was encompassed, and which defended the entrance thereof. And Varro supposes, that the golden apples were nothing but sheep. Others, with more probability, say they were oranges.

The Gardens of the HESPERIDES are placed by some authors at Larache, a city of Fez; by others at Bernich a city of Barca, which tallies better with the fable. Others take the province of Susa in Morocco for the island wherein the garden was seated. And, lastly, Rudbecks places the Fortunate Islands, and the gardens of the Hesperides, in his own country Sweden.

HESPERIDUM INSULÆ, in *Ancient Geography*, islands near the Hesperi Cornu; but the accounts of them are so much involved in fable, that nothing certain can be affirmed of them.

HESPERIS, ROCKET, *Dame's Violet*, or *queen's gilliflower*; a genus of plants belonging to the tetradynamia class; and in the natural method ranking under the 39th order, *Siliquosæ*. See BOTANY *Index*.

HESPERUS, in fabulous history, son of Cephalus by Aurora, as fair as Venus, was changed into a star, called *Lucifer* in the morning, and *Hesperus* in the evening. See HESPER.

HESSE, a country of Germany, in the circle of the Upper Rhine; bounded on the south by the bishoprick of Fulda; on the east by the principalities of Hersfeld, Thuringia, and Eichsfeld, as also by that of Calenburg; on the north by the bishoprick of Paderborn and Waldeck, the duchy of Westphalia, and the county of Witgenstein; and on the west, by Nassau-Dillenburg, the county of Solins, and Upper-Isenburg. In the above limits, the county of Katzenellnbogen and some other territories are not included. The whole country, in its utmost length, is near 100 miles, and in some places near as much in breadth. The air is cold, but wholesome; and the soil fruitful in corn, wine, wood, and pasture. The country abounds also in cattle, fish, and game; salt springs, baths, and mineral waters. The hills, which are many, yield silver, copper, lead, iron, alum, vitriol, pit-coal, sulphur, boles, a porcelain earth, marble, and alabaster. In the Eder, gold is sometimes found; and at Frankenberg a gold mine was formerly wrought. Besides many lesser streams, Hesse is watered by the following rivers, viz. the Lhan, the Fulda, the Eder or Schwalm, the Werra or Weser, and Diemel. The Rhine also and the Mayne pass through the country of Katzenellnbogen. This country, like most others in Germany, has its states, consisting of the *prelates*, as they are called, the nobility, and the towns. The diets are divided into general and particular, and the latter into the greater and smaller committees. The house of Hesse is divided into two principal branches, viz. Cassel and Darmstadt, of which Philipsdale, Rhinfeldts, and Homburg, are collateral branches; the two first of Hesse-Cassel, and the last of Hesse-Darmstadt. Their rights and privileges are very considerable. In particular, they have several votes at the diets of the empire; and causes, not exceeding 1000 florins, are determined by the courts of the country, without appeal. The princes of Hesse-Cassel are not of age till they are 25, but those of Hesse-Darmstadt are so at 18. The right of primogeniture hath been established in both houses. The revenues of Darmstadt are said to amount to near 100,000l. a-year, and those of Hesse-Cassel to near 200,000l. The small county of Schaumberg alone yields a revenue of 10,000l. and that of Katzenellnbogen, with the forests of Richardswalde, it is said, was farmed near 200 years ago at 12,000l. The prince of Hesse-Cassel has 40 or 50,000 men in his dominions fit to bear arms; and the troops that he hires out have often brought him in large sums, especially from Great Britain. He keeps a standing army of 15,000 men. This family is allied to most if not all of the Protestant princes in Europe. The branches of Cassel, Homburg, and Philipsdale, are Calvinists; that of Darmstadt, Lutherans; and that of Rhinfeldts, Roman Catholics. The prince of Hesse-Cassel, in the year 1749, embraced the Roman Catholic religion; but in 1754 drew up, and confirmed by oath, an instrument, of which all the Protestant princes are guarantees, declaring that the established religion of his dominions should continue in every respect as before, and that his children should be brought up and instructed therein. Here, as in the other Protestant Lutheran countries of Germany, are consistories, superintendants, and inspectors of the church. In the whole landgraviate are three universities, besides Latin schools and gymnasia, for the education of youth. The manufactures of Hesse are linen cloth, hats, stockings, gloves, paper, goldsmiths wares; and at Cassel a beautiful porcelain is made. They have also the finest wool in Germany; but are reproached with want of industry, in exporting instead of manufacturing it themselves.—This is supposed to have been the country of the ancient Catti, mentioned by Tacitus, &c. who in after-ages, were called *Chatti*, *Chassi*, *Hassi*, and *Hessi*. The two chief branches of Cassel and Darmstadt have many rights and privileges in common, which we have not room to specify. Both of them have a seat and vote in the college of princes at the diet of the empire, and those of this circle. Each of these princes, besides their guards and militia, maintains a considerable body both of horse and foot.

Hesse, Hessian Fly.

HESSIAN FLY, a very mischievous insect which lately made its appearance in North America; and whose depredations threaten in time to destroy the crops of wheat in that country entirely. It is, in its perfect state, a small winged insect; but the mischief it does is while in the form of a caterpillar; and the difficulty of destroying it is increased by its being as yet unknown where it deposits its eggs, to be hatched before the first appearance of the caterpillars. These mischievous insects begin their depredations in autumn, as soon as the wheat begins to shoot up through the ground. They devour the tender leaf and stem with great voracity, and continue to do so till stopped by the frost; but no sooner is this obstacle removed by the warmth of the spring, but the fly appears again, laying its eggs now, as has been supposed, upon the stems of the wheat just beginning to spire. The caterpillars, hatched from these eggs, perforate the stems of the remaining plants at the joints, and lodge themselves in the hollow within the corn, which shows no sign of disease till the ears begin to turn heavy. The stems then break; and being no longer able to perform their office in supporting and supplying the ears with nourishment, the corn perishes about the time that it goes into

Hessian Fly.

into a milky state. These insects attack also rye, barley, and timothy-grass, though they seem to prefer wheat. The destruction occasioned by them is described in the American Museum (a magazine published at Philadelphia) for February 1787, in the following words: "It is well known that all the crops of wheat in all the land over which it has extended, have fallen before it, and that the farmers beyond it dread its approach; the prospect is, that unless means are discovered to prevent its progress, the whole continent will be overrun;—a calamity more to be dreaded than the ravages of war."

This terrible insect appeared first in Long Island during the American war, and was supposed to have been brought from Germany by the Hessians; whence it had the name of the *Hessian fly*. From thence it has proceeded inland at the rate of about 15 or 20 miles annually; and by the year 1789 had reached 200 miles from the place where it was first observed. At that time it continued to proceed with unabating increase; being apparently stopped neither by rivers nor mountains. In the fly state it is likewise exceedingly troublesome; by getting into houses in swarms, falling into victuals and drink; filling the windows, and flying perpetually into the candles. It still continued to infest Long Island as much as ever; and in many places the culture of wheat was entirely abandoned.

The American States are likewise infested with another mischievous insect, named the *Virginian wheat-fly*. This, however, has not yet passed the river Delaware; though there is danger of its being gradually inured to colder climates so as to extend its depredations to the northern colonies also. But it is by no means the same with the Hessian fly. The wheat fly is the same with that whose ravages in the Angumois in France are recorded by M. Du Hamel; it eats the grain, and is a moth in its perfect state. On the other hand, the Hessian fly has hitherto been unknown to naturalists; it eats only the leaf and stalk; and, in its perfect state, is probably a tenthredo, like the black negro-fly of the turnip.

As of late years great quantities of wheat were imported from America into Britain, it became an object worthy of the attention of government to consider how far it was proper to allow of such importation, lest this destructive insect might be brought along with the grain. The matter, therefore, was fully canvassed before the privy council; and the following is the substance of the information relative to it; and in consequence of this, the importation of American wheat was forbid by proclamation.

1. By a letter, dated 22d April 1788, Mr Bond, consul at Philadelphia, informed the marquis of Caermarthen, that there was a design to export wheat from thence to England; that the fly had made great depredations; and that there might be danger of its thus being conveyed across the Atlantic. He added, that it was not known where the eggs of the insect were deposited, though it was supposed to be in the grain. Steeping the seed in elder juice he recommended as an effectual remedy and preservative of the crop.

2. In consequence of this information his Lordship wrote to Sir Joseph Banks, president of the royal society, desiring him to inquire as much as possible concerning the insect, both with regard to its natural history, and the method of preventing its ravages. In this research, however, that learned gentleman mistook the insect called the *flying weevel* for the *Hessian fly*. Of this insect he gives a description; but in a little time, being sensible of his mistake, he observed to the council, that his report to the marquis of Caermarthen applied not to the Hessian fly, but to a different insect, viz. the *flying weevil;* that the danger of importing this insect was much greater than that of the Hessian fly. The corn already brought from America, he was of opinion, might easily be examined, and a discovery made whether the fly had been there. Among other methods which might be used for this purpose, that of putting the corn among water was one, when the infected grains would rise to the top, and might then be opened and examined. Some slight trials of that kind he had already made; and found manifest signs of the fly in some grains which he had opened.

3. A farther account of the insect was given by Dr Mitchel, in consequence of the above-mentioned letter from the marquis of Caermarthen. According to him it was first discovered in the year 1776, on Staten Island, and the west end of Long Island; since that time it proceeded regularly through the southern district of the state of New York, part of Connecticut; and at the time of giving the account, July 1788, had got into New Jersey. As it appeared about the time that the Hessian troops arrived, an opinion had gone abroad that they brought it along with them; but the Doctor was of opinion that it is a native animal, nourished by some indigenous plant, but which then, for the first time, came among the wheat, and found it proper food. He had seen the caterpillar, chrysalis, and fly, but never could find the egg, or discover where it is deposited. The caterpillar appears, as has already been said, in autumn, and, after having devoured the tender stalk, soon becomes a chrysalis, coloured like a flax-seed; which, being fixed between the leaf and the stalk, injures the plant by its mechanical pressure; from this proceeds the fly, which is either able of itself to sustain the intense winter frosts, or lays eggs capable of doing it. Early in the spring the caterpillar appears again, even when the heat is scarce sufficient to make the wheat grow; its ravages, therefore, are at this period particularly destructive; and it passes through its metamorphoses with such speed, as to produce a third generation while the wheat is yet tender and juicy; however, as the corn has by this time grown considerably, the third generation is not so destructive as the second. It hurts chiefly by rendering the straw weak, and liable to break down when loaded afterwards by the weight of a full ear; "and sometimes (says the Doctor) it will be infested by the fourth swarm before harvest."

4. In another communication of Sir Joseph Banks, dated July 24. 1788, he makes some general observations on the nature of those caterpillars from which flying insects proceed; and to which class both the flying weevil and Hessian fly belong. Nature, he observes, has provided against the kinds of danger these tender insects are most likely to meet with. Thus, in climates where the winters are severe, the eggs of the most tender insects resist the force of the usual frost; in seasons of remarkable severity, indeed, some are destroyed;

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ſtroyed; but a ſufficient number always eſcape for propagating the ſpecies. The young caterpillar, if hatched before its proper food be ready, will ſurvive even weeks before it periſhes for want of nouriſhment; and in ſome few inſtances where it is hatched in the autumn, it is directed by inſtinct to ſpin a web, in which it remains torpid and without food during the whole winter. The chryſalis, though deprived of loco-motion, is capable of reſiſting various dangers, ariſing from cold, heat, wet, &c.; and the length of time which the animal remains in that ſtate is capable of very conſiderable extenſion. The complete animal, tender as it appears, and intended to exiſt no longer than is neceſſary to fulfil the buſineſs of propagation, which, in ſome ſpecies, is gone through in a few days, nevertheleſs is capable, in ſome inſtances, of enduring the utmoſt variation of climate; and if by accidental circumſtances, the ſexes are prevented from meeting, its ſhort life is extended to many times the amount of its uſual duration.

The obſervations on the fly made by Sir Joſeph in this paper, are not different from thoſe already related; only he diſſents from the opinion of Mr Bond, that the eggs are laid on the grain; thinking it more probable from analogy, that they are depoſited on the ſtraw; and being ſhaken off from thence by the ſtrokes of the flail in thraſhing, are mixed with the corn; from whence it muſt be very difficult to ſeparate them. Hence he concluded, that there was an apparent and very great riſk of importing the eggs along with the corn; and there was no doubt, that when once they had got a footing, they would eſtabliſh themſelves in Britain as well as in America. It muſt be obſerved, however, that none of the grain which was examined ſhowed any ſigns of this fly, its eggs, or caterpillars; ſuch inſects as were found in ſome diſeaſed ſpecimens being only the weevils common in England as well as in other countries; though ſome which were inſpected in the month of Auguſt this year contained the chryſalis of ſome inſects, which Sir Joſeph Banks was of opinion might be the flying weevil; and as he did not know whether theſe would revive or not, he gave it as his opinion, that the cargo in which they were found ought not to be ſuffered to come into the kingdom.

5. In order to procure all the intelligence that could be had concerning theſe inſects, the duke of Dorſet addreſſed a letter to the Royal Society of Agriculture in France, to know whether any of them exiſts in that country. The report of the ſociety was accompanied with a drawing of two inſects; one of which was ſuppoſed to be the caterpillar of the Heſſian fly, from its attacking the wheat only when in the herb; beginning its ravages in autumn, reappearing in the ſpring, and undergoing the metamorphoſes already mentioned. "That inſect (ſay the ſociety), whoſe havock has been well known in America only ſince 1776, does not appear to differ from it, as well as we can judge from a very ſhort deſcription of thoſe which have been obſerved in the north, and of which the hiſtory is contained in the different volumes of the academy of ſciences of Stockholm. We know that there exiſt in France caterpillars whoſe manner of living reſembles that of thoſe inſects; but the miſchief which they do to corn having never been conſiderable enough to attract the attention of government, and not having been ourſelves engaged in following in detail the hiſtory of that ſpecies of caterpillar, we regret not being able to ſay any thing particular upon that ſubject." The reſt of the report contains an account of the flying weevil.

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6. Further recourſe was now had to America for information. The marquis of Caermarthen wrote to Sir John Temple at New York, the Britiſh conſul general; and this gentleman applied to Colonel Morgan, who had been more curious with reſpect to this inſect than any other perſon with whom he was acquainted. His account was, that the Heſſian fly was firſt introduced into America by means of ſome ſtraw made uſe of in package, or otherwiſe landed on Long Iſland at an early period of the late war; and its firſt appearance was in the neighbourhood of Sir William Howe's debarcation, and at Flat Buſh. From thence it ſpread in every direction, but at firſt very ſlowly; and it was not till the year 1786 that they reached Mr Morgan's farm, ſituated not quite 50 miles from New York. No damage was done the firſt ſeaſon, and very little the ſecond; but in 1788 they were materially damaged, and in ſome places totally deſtroyed all round. "The name of *Heſſian fly* (ſays Mr Morgan) was given to this inſect by myſelf and a friend early after its firſt appearance on Long Iſland." In a letter to General Waſhington, dated July 31ſt 1788, Mr Morgan treats particularly of the inſect itſelf, and mentions ſeveral experiments made by himſelf to oppoſe its depredations. The reſult of theſe was, that good culture of ſtrong ſoil, or well manured lands, may ſometimes produce a crop of wheat or barley, when that ſowed on poor or middling ſoil, without the other advantages, will be totally deſtroyed. "But (ſays he) as the inſect lives in its aurelia ſtate in ſtraw and litter through the winter, I find that unmixed barn-yard manure ſpread on the land in the ſpring multiplies the fly to an aſtoniſhing degree: hence the farmer will ſee the neceſſity of mixing his yard with earth and marle in heaps; adding, where he can do it, a quantity of lime, and changing the heaps, after they have undergone the neceſſary fermentation, that their parts may be well incorporated, and a new digeſtion brought on, which will effectually deſtroy the inſects. Rolling of wheat juſt before the firſt froſts in autumn, and ſoon after the laſt in ſpring, or before the wheat begins to pipe or ſpindle, has alſo a good effect. In the firſt place, it is a part of good culture; and, ſecondly, the roller cruſhes and deſtroys a great proportion of the inſects. Top-dreſſings of lime, or of live aſhes, are uſeful as manures, and may (when applied about the times I have mentioned as proper for rolling) be offenſive to the inſect; but if uſed in ſufficient quantity to deſtroy them, would, I believe, deſtroy the wheat alſo. In the year 1782, a particular ſpecies of wheat was introduced on Long Iſland, which is found to reſiſt the fly, and to yield a crop when all other wheats in the ſame neighbourhood are deſtroyed by it. But as this wheat has been incautiouſly ſowed in field with other kinds, it has generally become ſo mixed by the farmers, as to ſuffer in its character in proportion to this mixture; inſomuch, that ſome farmers, from inattention to this circumſtance, have condemned it altogether. Fortunately, however, ſome crops have been preſerved from this degeneration; and I was ſo lucky as to procure the whole of my laſt year's ſeed of the pureſt kind:

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the consequence of which has been a good crop, whilst my neighbours fields, sowed with other kinds of wheat, have been either totally destroyed or materially injured. I have satisfied myself that this species of wheat was brought to New-York in 1782; that a cargo of it was then sent to Messrs. Underhill's mill to be manufactured into flour; and that, from seed saved out of this parcel, the yellow-bearded wheat was propagated. It is a generally received opinion, that the capacity of the yellow-bearded wheat to resist the attacks of the fly is owing to the hardness or solidity of the straw; but when we reflect that other wheats are sometimes wholly cut off in the fall of the year, and sometimes early in the spring, before the season of its running to straw, we shall be induced to assign some other cause. I cannot point out more than two distinctions of this from other wheats. This first is in the ear, at or after harvest. The obvious difference, then, is in the colour of the chaff. The second can only be observed by the miller, who says, 'this grain requires to be more aired and dried than any other wheat before grinding, or it will not yield its flower so kindly, as it is of a more oily nature; but when thus aired and dried, the quality and quantity of its flour are equal to that of the best white wheat."

7. In a letter from Mr Wadsworth, dated 22d August 1788, we are informed, that the experiments made with elder juice, recommended as a preventive of this evil by Mr Bond, were fallacious, and had failed in every instance in 1785; but the efficacy of the yellow-bearded wheat in resisting the attacks of the fly is confirmed. The progress of the fly northward is likewise confirmed; but we are told that it has disappeared in many places near New York, where it formerly abounded.

8. In consequence of the correspondence between the marquis of Caermarthen and Mr Bond, the latter made very particular inquiry concerning this mischievous insect, and has given a better account of it than any of the above. "The Hessian fly (says he) is a small dark fly, with thin, long, black legs; clear transparent wings, extending far beyond the body of the trunk; with small, though perceptible, horns or feelers projecting from the snout. These I have seen appear in size and shape like a little fly which attacks cheese in this country, and which is very closely watched by the keepers of dairies here, as productive of the worm or skippers which destroy cheese; and it is remarkable, that the worm produced from the egg of the Hessian fly, though rather thinner and longer, bears a strong resemblance to the worm in cheese. The horns which evidently appear on the Hessian fly may be provided by nature as feelers to enable them to perforate hard grain, as well as grain in a softer state; though I have not yet seen any person who has perceived the egg, worm, or fly, in the grain of the wheat, or who has found any nit, mucus, or even dust, in the dry straw, in ricks or barns, to induce a belief that the egg is there deposited after the harvest. One publication, signed a Landholder, goes so far as to favour the idea that the fly even perforates the seed, and deposits its eggs therein. His ideas have been condemned, as tending to mislead others; but by no means confuted either by reason or experiment. An observation I made myself, gave me some cause to apprehend that the idea mentioned in the paper signed a Landholder was founded in fact: Upon examining a barn, in a country wherein the fly had not been known to injure the harvest (though it has now certainly made its appearance there within a few weeks), I observed in the flaws and apertures where the wood was decayed, over which cobwebs were woven, several of these flies entangled in the webs, many of them dead, but some alive, and struggling to disengage themselves; from hence I concluded that there was a propensity in the fly to get into the mow; but whether with a purpose of mere shelter and nurture, or with a view to deposit its eggs, I am at a loss to decide."

9. Mr Bond then refers to some observations by a Mr Potts and Mr Cleaver, which, with several other papers on the subject, he had inclosed in his letter to the marquis. The former was a farmer in the county of Chester, who stacked his wheat in autumn 1788, at a time when the fly had not been seen in or near that county. About six or seven weeks after the harvest he had occasion to thresh some of his wheat; and with a view to prevent its scattering and wasting, he threw the sheaves from the rick upon a large sheet. On taking up the sheaves to carry them to the threshing-floor, he perceived a great number of flies, answering precisely the description of the Hessian fly, lying upon the sheet, some dead, and others in a torpid state; from whence he concluded that the fly had got a footing in his rick; but from any examination either of the straw or grain, no trace of the eggs being deposited was discovered. Mr Cleaver, a farmer in the same county, apprehending that the fly might approach his neighbourhood, sowed some wheat in his garden, which grew so as to appear above ground in less than a fortnight, when a violent north-east wind came on; and immediately after he perceived small clouds of flies over and about the wheat he had sown. He examined the grain in a few days; and found that numbers of the flies had deposited their eggs in the heart of the main stalk, and many of them lay dead on the ground where the wheat was sown, and near it. Many of the eggs were found in the stalk; and some small white worms produced from other eggs were lately discovered in the stalk very near the root of the wheat. Wherever these worms were found, the whole of the individual stalk was perceptibly changed in point of colour, tending to a yellowish cast; the top hanging down quite shrunk and withered. In some of the wheat which was carefully examined, the eggs were found within the stalk, of a very minute size and whitish colour, with something of a yellow tinge. In those where the worm was formed, it was carefully wrapped up, surrounded by different coats of the shoot in which it lay, as if it had been skilfully and tenderly rolled up for its preservation; around it the stalk was plainly eaten away, some nearly through. The worm strongly resembles the skipper in cheese, somewhat thinner, and rather longer, of a whitish cast. The ground on which this wheat was sown was rich garden ground, high and dry; the natural soil a strong red clay; few of the shoots, of which there were many in one cluster, in proportion to their number, were hurt by the fly. This was imputed to the strength of the soil, which producing a robust powerful growth, resisted, in a great

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great degree, the attack of the fly, though the weak shoots suffered generally.

10. A similar account of the Hessian fly is given by Mr Jacobs, an experienced farmer in the county of Montgomery. From his observations the egg is usually deposited in the funnel or sheath, a little above the first joint. When the eggs are laid in the autumn or spring, they are utterly destructive of the growth of the wheat; but when they are deposited shortly before the harvest, the grain or even the stalk is scarcely affected, especially in rich ground. The egg, he says, is at first very minute; it grows rapidly, becomes full and large, and turns to a brown hue, in size and colour very like a flax seed. A material difference was also perceived between rich and poor ground with respect to the ravages of the fly; but none between moist and dry soils. He is also of opinion that the yellow-bearded wheat will resist the attacks of the fly; and that rolling and feeding the wheat will be of great service.

11. A farmer in Jersey, who dates his letter from Hunterdon, Jan. 30. 1787, observes, that though the fly is supposed to advance about 15 miles annually, and neither waters nor mountains obstruct its passage; yet when disturbed, he never saw them take a flight of above five or six feet; nevertheless they are so active, that it is very difficult to catch them. They first appear towards the end of September; and soon after their eggs appear hatched, in colour and size like a flax seed: they are very low at the joints; some even in the ground; and here they harbour all winter. On their first appearance in any district, their numbers being small they seldom cut off the crop in this state, which is often the case the second or third year. In the spring, after warm weather, they again appear as a small worm, and destroy the crop. The remedies proposed by this farmer are, sowing upon rich ground, elder, and rolling. A gentleman whose account was dated on the first of November 1786, says, that their eggs resemble what is commonly called the *fly-blow* on meat, being very small, and only one in a place. Soon after, the other blades of wheat proceeding from the same kernel inclose the first, the egg is covered, and agreeable to the usual progress of insects arrives at the state of a worm, and descends towards the root, where it consumes the tender blade, sometimes destroying the whole crop in the fall; but if, by reason of the fertility of the soil, and other concurrent circumstances, the vegetation is so rapid as to baffle their efforts, some of the latter-laid eggs, when at the worm-state, entrench themselves in the ground to the depth of an inch or more, where he had found them after severe frosts changed from a white to a greenish colour, and almost transparent; from this they proceed to the aurelia state, and thus continue probably in the ground till the spring, when the fly is again produced, which again lays its eggs, and finishes the work begun in the fall, to the total destruction of the crop. Another piece of intelligence he gives, but not from his own observation, that by feeding the wheat very close in the winter and spring, if the land is rich, it will again spring up, and the worms do not much injure the second growth. By another correspondent we are informed, that maritime places are less liable to be infested with the fly than the interior parts of the country; and therefore recommends as an experiment, that fine salt should be sprinkled on the wheat just before, or very soon after, the appearance of the fly. By others, elder has been much recommended, as well as rolling, &c. though the bearded wheat already mentioned seems to be the only effectual remedy.

12. By another communication from Mr Morgan to the Philadelphia Society for promoting agriculture, he informs us, that he had made himself acquainted with the fly by breeding a number of them from the chrysalis into the perfect state. The fly is at first of a white body with long black legs and whiskers, so small and motionless as not to be easily perceived by the naked eye, though very discernible with a microscope; but they soon become black and very nimble, both on the wing and feet, being about the size of a small ant. During the height of the brood in June, where 50 or 100 of the nits have been deposited on one stalk of wheat, he has sometimes discovered, even with the naked eye, some of them to twist and move on being disturbed: this is while they are white; but they do not then travel from one stalk to another, nor to different parts of the same stalk. The usual time of their spring-hatching from the chrysalis is in May. "Those (says he) who are doubtful whether the fly is in their neighbourhood, or cannot find their eggs or nits in the wheat, may satisfy themselves by opening their windows at night and burning a candle in the room. The fly will enter in proportion to their numbers abroad. The first night after the commencement of wheat harvest, this season, they filled my dining-room in such numbers as to be exceedingly troublesome in the eating and drinking vessels. Without exaggeration I may say, that a glass tumbler from which beer had been just drunk at dinner, had 500 flies in it in a few minutes. The windows are filled with them when they desire to make their escape. They are very distinguishable from every other fly by their horns or whiskers." With regard to the cure, it seems to be confirmed that the sowing of that called the *yellow-bearded wheat* can only be depended upon. The fly indeed will reside in fields of this wheat, and lay its eggs upon the stalks; but no injury was ever known to happen, except in one single instance, where it was sown in a field along with the common sort, and that in a very small proportion to it. By another account, however, we are told that the yellow-bearded wheat is equally liable to be destroyed in the autumn with the common kind; so that the only method of securing the crop is by sowing it late in the season, when the fly is mostly over.

13. The utmost pains were taken by the British government to find out whether this destructive insect exists in Germany or any of the northern countries of Europe; but from the accounts received, it appears that it has not hitherto been observed, or at least if it exists, the damage done by it is too inconsiderable to attract notice.

14. From the whole correspondence on this subject, which from the abridgment just now given of it is evidently somewhat discordant, Sir Joseph Banks drew up a report for the privy council, dated March 2. 1789, in which he states the following particulars: 1. The appearance of the fly in Long Island was first observed in 1779. We must suppose this to be meant that

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that its destructive effects became then first perceptible; for it seems undoubtedly to have been known in the year 1776. 2. The opinion of Colonel Morgan, that it was imported by the Hessians, seems to be erroneous, as no such insect can be found to exist in Germany or any other part of Europe. 3. Since its first appearance in Long Island it has advanced at the rate of 15 or 20 miles a-year, and neither waters nor mountains have impeded its progress. It was seen crossing the Delaware like a cloud, from the Fall's Township to Makefield; had reached Saratoga 200 miles from its first appearance, infesting the counties of Middlesex, Somerset, Huntington, Morris, Sussex, the neighbourhood of Philadelphia, all the wheat counties of Connecticut, &c. committing the most dreadful ravages; attacking wheat, rye, barley, and timothy-grass. 4. The Americans who have suffered by this insect, speak of it in terms of the greatest horror. In Colonel Morgan's letter to Sir John Temple, he uses the following expressions. "Were it to reach Great Britain, it would be the greatest scourge that island ever experienced; as it multiplies from heat and moisture, and the most intense frosts have no effect on the egg or aurelia. Were a single straw, containing the insect, egg, or aurelia, to be carried and safely deposited in the centre of Norfolk in England, it would multiply in a few years, so as to destroy all the wheat and barley crops of the whole kingdom. There cannot exist such an atrocious villain as to commit such an act intentionally. 5. No satisfactory account of the mode in which this insect is propagated has hitherto been obtained. Those which say that the eggs are deposited on the stalk from six or eight to 50, and by their growth compress and hinder the stalk from growing, are evidently erroneous, and the authors of them have plainly mistaken the animal itself for its eggs. It is sufficient to remember, that eggs do not grow or increase in bulk, to prove that what they observed was not eggs. 6. The landholder's opinion, that the eggs are deposited on the ripe grains of wheat, though contradicted by Colonel Morgan, is not disproved, as the colonel advances no argument against it. 7. A letter dated New York, September 1. 1786, says, that the eggs are deposited on the young blade, resembling what we call a *fly-blow* in meat; very small, and but one in a place: but this, though the only natural mode of accounting for the appearance of the insect, had it been true, must undoubtedly have been confirmed by numbers of observations. 8. Even though this should be found hereafter to be the case, there will still remain a danger of the aurelias being beaten off by the flail from the straw in threshing the wheat, and imported into Britain along with it; the presence of these flies in barns having been fully proved by the observations of Messrs Potts and Bond. 9. None of the remedies proposed against this destructive insect have been in any degree effectual, excepting that of sowing the yellow-bearded wheat; the straw of which is sufficiently strong to resist the impression of the insect, and even if its eggs are deposited upon it, receives little injury in point of produce in grain: this provides, however, no remedy for the loss of the barley crop, nor for that which must be incurred by sowing the yellow-bearded wheat on lands better suited by nature for the produce of other kinds: it appears also that this very kind is liable to degenerate, and probably from a different cause than that proposed by Colonel Morgan, viz. the mixture with common wheat. 9. Though the Agricultural Society at Philadelphia, as well as Colonel Morgan, have declared their opinions decisively, that no danger can arise from wheat imported into Britain, as the insect has no immediate connection with the grain; yet with nearly, if not exactly the same materials before him which these gentlemen were furnished with, Sir Joseph Banks could not avoid drawing a conclusion directly contrary; and he concludes his report with the words of Mr Bond in a letter to the marquis of Caermarthen. "Satisfactory as it would be to my feelings to be able to say with precision, that I apprehend no danger of extending the mischief by seed, my duty urges me to declare, that I have not heard or seen any conclusive fact by which I could decide on a matter of such importance; and till that test occurs, the wisdom of guarding against so grievous a calamity is obvious."

On the 27th of April the same year, another paper, by way of appendix to the foregoing, was given in by Sir Joseph Banks. In this he again observes, that none of the descriptions of any European insect hitherto published answer exactly to the Hessian fly. In a letter from Mr Bond to the marquis of Caermarthen, he mentions another kind of insect in the state of Maryland, called by way of eminence *the fly*; and which in some things resembles the Hessian fly, though it cannot be accounted the same. It makes its way into the mow, and bites the ends of the grain perceptibly, and no doubt deposits its eggs in the grain itself; since it has been observed, that wheat recently threshed, and laid in a dry warm place, will soon be covered with an extreme clammy crust, which binds the wheat on the surface together in such a way as to admit its being lifted in lumps; but the wheat beneath will not be hurt to any considerable depth. Such is the quality of this fly, that if the hand be inserted into the heap affected by it, watery blisters are immediately raised; and the farmers and slaves, riding upon bags of this infected wheat, never fail to be severely blistered thereby. "This insect (says he) is called in Maryland the *Revolution fly*, by the friends of the British government; but from all I can learn it is not the same insect which originated on Long Island, and is called the *Hessian fly* (by way of opprobrium) by those who favoured the revolution. All the papers I have read on the Hessian fly are very inaccurate, not to say contradictory; and I am convinced it is by no means a settled point at this moment, in what manner and place the eggs of these insects are deposited. The policy which induced government to open the ports being founded on an appearance of a scarcity of corn, that evil may be remedied by the admission of flour instead of grain; and though the countries from whence the flour is carried will have the advantage of the manufacture, still that cannot be reckoned as an object, when opposed in the scale to an evil of such immense magnitude as the introduction of so destructive an insect may occasion. The ravages here are beyond conception ruinous. Many farmers have had their crops so completely cut off as to be left without bread-corn or even seed-corn. If the measure of confining the importation to flour alone should be adopted, great attention

attention should be paid to the quality of the flour admitted into the British ports. An infinite deal of the wheat of the last harvest is of a very wretched quality; and stratagems will be practised to give an extensive vent to so essential a staple of the middle states of America."

In another letter to the same nobleman, Mr Bond expresses himself to the following purpose. "I have not been able to collect any decided information which fixes the essential point, how far the insect may be communicated by seed. It is a matter at this time quite undecided here: nor have I heard or observed any very conclusive reason to suppose that the fly makes its way generally into barns and ricks. A very intelligent farmer in the county of Bucks, informed me that it was the prevailing opinion there, and so I found it, that the fly did not, either in the field or in the mow, affect the grain of the wheat: a neighbour of his, in threshing the little wheat he had saved last harvest, observed the fly rise from the straw in great numbers wherever it was struck by the flail; but though it was at first presumed that the fly had insinuated itself into the mow for the purpose of depositing its eggs in the grain or in the straw, no trace of the egg could be discovered from the appearance of any mucus or dust, either in the grain or in the straw; hence it was inferred that all the mischief was done in the field."

HESYCHIUS, the most celebrated of all the ancient Greek grammarians whose works are now extant, was a Christian; and, according to some, the same with Hesychius patriarch of Jerusalem, who died in 609. He wrote a Greek lexicon; which, in the opinion of Casaubon, is the most learned and useful work of that kind produced by the ancients. Schrevelius published a good edition of it in 1668, in 4to, with notes; but the best is that of John Alberti, printed at Leyden in 1746, in two vols folio.

HETERIARCH, HÆTERIARCHA, in antiquity, an officer in the Greek empire, whereof there were two species; the one called simply *heteriarch*, and the other *great heteriarch*, who had the direction of the former.

The work is Greek, ἑταιριαρχα, formed of the Greek ἑταιρος *socius*, "companion, ally," and αρχη *imperium*, "command." Their principal function was to command the troops of the allies; besides which, they had some other duties in the emperor's court, described by Codin, *De Officiis*, cap. 5. N° 30, 31, 32, 37.

HETEROCLITE, HETEROCLITON, in *Grammar*, an irregular or anomalous word, which either in declension, conjugation, or regimen, deviates from the ordinary rules of grammar. The word is Greek, ἑτεροκλιτον; formed of ἑτερος *alter*, "another, different," and κλινω, "I decline."

Heteroclite is more peculiarly applied to nouns which vary or are irregular in point of declension; having fewer cases, numbers, &c. than ordinary; or that are of one declension in one number, and another in another: as *Hoc vas, vasis; hæc vasa, vasorum.*

HETERODOX, in *Polemical Theology*, something that is contrary to the faith or doctrine established in the true church. The word is formed of the Greek ἑτεροδοξος; a compound of ἑτερος "*alter*," and δοξα," opinion." Thus, we say a *heterodox* opinion, a *heterodox* divine, &c. The word stands in opposition to *orthodox*.

HETEROGENEITY, in *Physics*, the quality or disposition which denominates a thing *heterogeneous*. The word is also used for the heterogeneous parts themselves: in which sense, the heterogeneities of a body are the same thing with the impurities thereof.

HETEROGENEOUS, or HETEROGENEAL, literally imports something of a different nature, or that consists of parts of different or dissimilar kinds; in opposition to *homogeneous*. The word is Greek; formed of ἑτερος *alter*, "different," and γενος *genus*, "kind;" *q. d.* composed of different kinds of parts.

HETEROGENEOUS Light, is by Sir Isaac Newton said to be that which consists of rays of different degrees of refrangibility. Thus the common light of the sun or clouds is heterogeneous, being a mixture of all sorts of rays.

HETEROGENEOUS Nouns, one of the three variations in irregular nouns; or such as are of one gender in the singular number, and of another in the plural.—Heterogeneous, under which are comprehended mixed nouns, are sixfold. 1. Those which are of the masculine gender in the singular number, and neuter in the plural; as, *hic tartarus, hæc tartara.* 2. Those which are masculine in the singular number, but masculine and neuter in the plural; as, *hic locus, hi loci et hæc loca.* 3. Such as are feminine in the singular number, but neuter in the plural; as, *hæc carbasus, et hæc carbasa.* 4. Such nouns as are neuter in the singular number, but masculine in the plural; as, *hoc cœlum, hi cœli.* 5. Such as are neuter in the singular, but neuter and masculine in the plural; as, *hoc rastrum, hi rastri, et hæc rastra.* And, 6. Such as are neuter in the singular, but feminine in the plural number; as, *hoc epulum, hæ epulæ.*

HETEROGENEOUS Quantities, are those which are of such different kind and consideration, as that one of them, taken any number of times, never equals or exceeds the other.

HETEROGENEOUS Surds, are such as have different radical signs; as $\sqrt{aa}$, and $\sqrt[3]{bb}$; $\sqrt[5]{9}$, and $\sqrt[7]{19}$.

HETEROSCII, in *Geography*, a term of relation, denoting such inhabitants of the earth as have their shadows falling but one way, as those who live between the tropics and polar circles; whose shadows at noon in north latitude are always to the northward, and in south latitude to the southward.

HETH, the father of the Hittites, was the eldest son of Canaan (Gen. x. 15.), and dwelt southward of the promised land, at Hebron or thereabouts. Ephron, an inhabitant of Hebron, was of the race of Heth, and this whole city in Abraham's time was peopled by the children of Heth. There are some who maintain that there was a city called Heth, but we find no footsteps of it in the Scripture.

HETRURIA, and ETRURIA, a celebrated country of Italy, at the west of the Tyber. It originally contained 12 different nations, which had each their respective monarch. Their names were Veientes, Clusini, Perusini, Cortonenses, Arretini, Vetuloni, Volaterrani, Rusellani, Volscinii, Tarquinii, Falisci, and Cæretani. The inhabitants were particularly famous for their superstition and strict confidence in omens, dreams, auguries, &c. They all proved powerful and refolute enemies to the rifing empire of the Romans, and were conquered only after much effufion of blood.

HEVÆI, in *Ancient Geography*, one of the feven tribes who occupied Canaan; a principal and numerous people, and the fame with the *Kadmonæi*, dwelling at the foot of Hermon and part of Libanus, or between Libanus and Hermon (Judges iii. 3.). To that Bochart refers the fables concerning Cadmus and his wife Harmonia, or Hermonia, changed to ferpents; the *Hevi* denoting a wild beaft, fuch as is a ferpent. Cadmus, who is faid to have carried the ufe of letters to Greece, feems to have been a Kadmonæan; of whom the Greeks fay that he came to their country from Phœnicia.

HEUCHERA, a genus of plants belonging to the pentandria clafs. See BOTANY *Index*.

HEVELIUS, or HEVELKE, *John*, an eminent aftronomer, was born at Dantzic in 1611. He ftudied in Germany, England, and France, and every where obtained the efteem of the learned. He was the firft that difcovered a kind of libration of the moon, and made feveral important obfervations on the other planets. He alfo difcovered feveral fixed ftars, which he named the *firmament of Sobiefki*, in honour of John III. king of Poland. His wife was alfo well fkilled in aftronomy, and made a part of the obfervations publifhed by her hufband. In 1673 he publifhed a defcription of the inftruments with which he made his obfervations, under the title of *Machina Cœleftis*: and in 1679 he publifhed the fecond part of this work; but in September the fame year, while he was at a feat in the country, he had the misfortune to have his houfe at Dantzic burnt down. By this calamity he is faid to have fuftained a lofs of feveral thoufand pounds; having not only his obfervatory and all his valuable inftruments and apparatus deftroyed, but alfo a great number of copies of his *Machina Cœleftis*; which accident has made this fecond part very fcarce, and confequently very dear. In the year 1690 were publifhed *Firmamentum Sobiefcianum* and *Prodromus aftronomicæ et novæ tabulæ folares, una cum catalogo fixarum*, in which he lays down the neceffary preliminaries for taking an exact catalogue of the ftars. But both thefe works are pofthumous: for Hevelius died in 1687, on his birth-day, aged 76. He was a man greatly efteemed by his countrymen, not only on account of his great reputation and fkill in aftronomy, but as a very excellent and worthy magiftrate. He was made a burgomafter of Dantzic; which office he is faid to have executed with the utmoft integrity and applaufe. He was alfo very highly efteemed by foreigners; and not only by thofe fkilled in aftronomy and the fciences, but by foreign princes and potentates: as appears abundantly from a collection of their letters which was printed at Dantzic in the year 1683.

HEUSDEN, a ftrong town of the United Provinces, in Holland, feated on the river Maefe, among marfhes, with a handfome caftle, in E. Long. 5. 3. N. Lat. 51. 47.

HEWSON, WILLIAM, a very ingenious anatomift, was born in 1739. He became affiftant to Dr Hunter, and was afterwards in partnerfhip with him; but on their difagreement, read anatomical lectures at his own houfe (in which he was feconded by Mr Falconer). He wrote Inquiries into the Properties of the Blood, and the Lymphatic Syftem, 2 vols; and difputed with Dr Monro the difcovery of the lymphatic fyftem of veffels in oviparous animals. He died in 1774.

HEXACHORD, in ancient mufic, a concord called by the moderns a *fixth*.

HEXAGON, in *Geometry*, a figure of fix fides and angles; and if thefe fides and angles are equal, it is called a *regular hexagon*.

HEXAHEDRON, in *Geometry*, one of the five platonic bodies, or regular folids, being the fame with a cube.

HEXAMETER, in ancient poetry, a kind of verfe confifting of fix feet; the firft four of which may be indifferently either fpondees or dactyles; the fifth is generally a dactyl, and the fixth always a fpondee. Such is the following verfe of Horace:

1 2 3 4 5 6
Aut pro|deffe vo|lunt, aut| dele|ctare po|etæ

HEXAMILION, HEXAMILI, or *Hexamilium*, a celebrated wall, built by the emperor Emanuel in 1413 over the ifthmus of Corinth. It took its name from ἕξ *fix*, and μιλιον, which in the vulgar Greek fignifies a *mile*, as being fix miles long.

The defign of the hexamilion was to defend Peloponnefus from the incurfions of the barbarians. Amurath II. having raifed the fiege of Conftantinople in the year 1424, demolifhed the hexamilium, though he had before concluded a peace with the Greek emperor. The Venetians reftored it in the year 1463, by 30,000 workmen, employed for 15 days, and covered by an army commanded by Bertoldo d'Efte general of the land forces, and Louis Loredano, commander of the fea.—The Infidels made feveral attempts upon it; but were repulfed, and obliged to retire from the neighbourhood thereof: but Bertoldo being killed at the fiege of Corinth, which was attempted foon after, Bertino Calcinato, who took on him the command of the army, abandoned, upon the approach of the beglerbeg, both the fiege and the defence of the wall which had coft them fo dear; upon which it was finally demolifhed.

HEXANDRIA, in *Botany*, (from ἕξ *fix*, and ανηρ *a man*); the name of the fixth clafs in Linnæus's fexual method, confifting of plants with hermaphrodite flowers, which are furnifhed with fix ftamina or male organs, that are of an equal length. See BOTANY *Index*.

HEXAPLA (formed of ἕξ *fix*, and απλοω, *I open*, *I unfold*), in church-hiftory, a Bible difpofed in fix columns; containing the text, and divers verfions thereof, compiled and publifhed by Origen, with a view of fecuring the facred text from future corruptions, and to correct thofe that had been already introduced.

Eufebius, Hift. Eccl. lib. vi. cap. 16. relates, that Origen, after his return from Rome under Caracalla, applied himfelf to learn Hebrew, and began to collect the feveral verfions that had been made of the facred writings, and of thefe to compofe his Tetrapla and Hexapla; others, however, will not allow him to have begun till the time of Alexander, after he had retired into Paleftine, about the year 231.

To conceive what this Hexapla was, it muft be obferved, that, befides the tranflation of the facred writings, called the Septuagint, made under Ptolemy Philadelphus,

ladelphus, above 280 years before Christ, the Scripture had been since translated into Greek by other interpreters. The first of those versions, or (reckoning the Septuagint) the second, was that of Aquila, a proselyte Jew, the first edition of which he published in the 12th year of the emperor Adrian, or about the year of Christ 128; the third was that of Symmachus, published, as is commonly supposed, under Marcus Aurelius, but, as some say, under Septimius Severus, about the year 200; the fourth was that of Theodotion, prior to that of Symmachus, under Commodus, or about the year 175. These Greek versions, says Dr Kennicott, were made by the Jews from their corrupted copies of the Hebrew, and were designed to stand in the place of the Seventy, against which they were prejudiced, because it seemed to favour the Christians. The fifth was found at Jericho, in the reign of Caracalla, about the year 217; and the sixth was discovered at Nicopolis, in the reign of Alexander Severus, about the year 228: lastly, Origen himself recovered part of a seventh, containing only the Psalms.

Now Origen, who had held frequent disputations with the Jews in Egypt and Palestine, observing that they always objected against those passages of Scripture quoted against them, and appealed to the Hebrew text; the better to vindicate those passages, and confound the Jews by showing that the Seventy had given the sense of the Hebrew, or rather to show by a number of different versions what the real sense of the Hebrew was, undertook to reduce all these several versions into a body along with the Hebrew text, so as they might be easily confronted, and afford a mutual light to each other.

He made the Hebrew text his standard: and allowing that corruptions might have happened, and that the old Hebrew copies might and did read differently, he contented himself with marking such words or sentences as were not in his Hebrew text, nor the later Greek versions, and adding such words or sentences as were omitted in the Seventy, prefixing an asterisk to the additions, and an obelisk to the others.

In order to this, he made choice of eight columns: in the first he gave the Hebrew text in Hebrew characters; in the second the same text in Greek characters; the rest were filled with the several versions above-mentioned; all the columns answering verse for verse, and phrase for phrase; and in the Psalms there was a ninth column for the seventh version.

This work Origen called Ἑξαπλα, *Hexapla*, q. d. *sextuple*, or work of six columns, as only regarding the first six Greek versions. See Tetrapla.

Indeed, St Epiphanius, taking in likewise the two columns of the text, calls the work *Octapla*, as consisting of eight columns.

This celebrated work, which Montfaucon imagines consisted of fifty large volumes, perished long ago, probably with the library at Cæsarea, where it was preserved, in the year 653; though several of the ancient writers have preserved us pieces thereof: particularly St Chrysostom on the Psalms, Philoponus in his Hexameron, &c. Some modern writers have earnestly endeavoured to collect fragments of the Hexapla, particularly Flaminius Nobilius, Drusius, and F. Montfaucon, in two folio volumes, printed at Paris in 1713.

HEXASTYLE, in *Architecture*, a building with six columns in front.

HEXHAM, a town of Northumberland, situated near the conflux of the north and south Tyne. It is commonly supposed to be the *Alexodunum* of the Romans, where the first cohort of the Spaniards were in garrison. It was made a bishop's see by Etheldreda, wife of King Egfred, in the year 675. Its first bishop St Wilfred built here a most magnificent cathedral and monastery, and it was possessed by seven bishops successively; but being very much infested by the Danes, the see was removed to York. The town and priory were destroyed by the Scots in 1296, and pillaged again in 1346. There was a remarkable and bloody battle fought near this town between the houses of Lancaster and York, wherein the former were defeated, chiefly by the extraordinary bravery and conduct of John Nevil, Lord Montacute, who was for that reason created earl of Northumberland. The present town is not populous, and the streets are narrow, with ill-built houses. The market-place, near the centre of the town, is a spacious square, and is supplied by a fountain with water. Among the remains of ancient structures is a gateway of ancient architecture, leading to the priory, but of a much older date. There are two ancient towers in the town, one of which is used as a sessions-house, and was formerly an exploratory tower; the other is on the top of a hill towards the Tyne, of remarkable architecture, which has been much higher than at present, and has two dungeons within it, besides several chambers with very little narrow windows. The town has a charity or grammar-school. It was in 1571 annexed to the county of Cumberland: but only in civil matters; for its ecclesiastical jurisdiction is not the same with the rest of the county, it being still a peculiar belonging to the archbishop of York; and the common people still call the neighbouring county Hexhamshire. It is a corporation governed by a bailiff.

HEYDON, a small well-built town in the east riding of Yorkshire, in that part called *Holdernesse*, seated on a river that falls into the Humber. It has now but one church, though there are the remains of two more; and had formerly a considerable trade, which is now lost, on account of its being so near Hull. It sends two members to parliament. W. Long. 0. 55. N. Lat. 53. 46.

Heydon, *John*, who sometimes assumed the name of *Eugenius Theodidactus*, was a great pretender to skill in the Rosicrucian philosophy and the celestial signs, in the reign of King Charles I.; and wrote a considerable number of chemical and astrological works, with very singular titles. This ridiculous author was much resorted to by the duke of Buckingham, who was infatuated with judicial astrology. He employed him to calculate the king's and his own nativity, and was assured that his stars had promised him great things. The duke also employed Heydon in some treasonable and seditious practices, for which he was sent to the Tower. He lost much of his former reputation by telling Richard Cromwell and Thurloe, who went to him disguised like cavaliers, that Oliver would infallibly be hanged by a certain time; this period, however, he outlived several years.

HEYLIN, Dr Peter, an eminent English writer, was

was born at Burford, in Oxfordſhire, in 1600. He ſtudied at Hart Hall, Oxford; where he took his degrees in arts and divinity, and became an able geographer and hiſtorian. He was appointed one of the chaplains in ordinary to King Charles I. was preſented to the rectory of Hemingford in Huntingdonſhire, made a prebendary of Weſtminſter, and obtained ſeveral other livings: but of theſe he was deprived by the parliament, who alſo ſequeſtrated his eſtate; by which means he and his family were reduced to great neceſſity. However, upon the reſtoration, he was reſtored to his ſpiritualities; but never roſe higher than to be ſub-dean of Weſtminſter. He died in 1662; and was interred in St Peter's church in Weſtminſter, where he had a neat monument erected to his memory. His writings are very numerous: the principal of which are, 1. *Microcoſmus*, or a deſcription of the Great World. 2. *Coſmographia*. 3. The hiſtory of St George. 4. *Eccleſia Vindicata*, or the church of England Juſtified. 5. Hiſtorical and Miſcellaneous Tracts, &c.

HEYWOOD, John, an Engliſh dramatic poet, was born at North-Mims, near St Alban's in Hertfordſhire, and educated at Oxford. From thence he retired to the place of his nativity; where he had the good fortune to become acquainted with Sir Thomas More, who, it ſeems, had a ſeat in that neighbourhood. This patron of genius introduced our comic poet to the princeſs Mary, and afterwards to her father Henry, who, we are told, was much delighted with his wit and ſkill in muſic, and by whom he was frequently rewarded. When his former patroneſs, Queen Mary, came to the crown, Heywood became a favourite at court, and continued often to entertain her majeſty, *exerciſing his fancy before her, even to the time that ſhe lay languiſhing on her deathbed.* On the acceſſion of Elizabeth, being a zealous Papiſt, he thought fit to decamp, with other favourites of her deceaſed majeſty. He ſettled at Mechlin in Flanders, where he died in the year 1565.—John Heywood was a man of no great learning, nor were his poetical talents by any means extraordinary; but he poſſeſſed talents of more importance in the times in which he lived, namely, the talents of a jeſter. He wrote ſeveral plays; 500 epigrams; *A Dialogue in verſe concerning Engliſh Proverbs;* and *The Spider and Fly, a Parable*, a thick 4to. Before the title of this laſt work is a whole-length wooden print of the author; who is alſo repreſented at the head of every chapter in the book, of which there are 77.—He left two ſons, who both became Jeſuits and eminent men: viz. Ellis Heywood, who continued ſome time at Florence under the patronage of Cardinal Polo, and became ſo good a maſter of the Italian tongue, as to write a treatiſe in that language, entitled *Il Moro;* he died at Louvain about the year 1572. His other ſon was Jaſper Heywood, who was obliged to reſign a fellowſhip at Oxford on account of his immoralities: he tranſlated three tragedies of Seneca, and wrote various poems and deviſes; ſome of which were printed in a volume entitled *The Paradiſe of Dainty Deviſes*, 4to, 1573. He died at Naples in 1597.

Heywood, *Eliza*, a voluminous novel writer; of whom no more is known than that her father was a tradeſman, and that ſhe was born about the year 1696. In the early part of her life, her pen, whether to gratify her own diſpoſition or the prevailing taſte, dealt chiefly in licentious tales, and memoirs of perſonal ſcandal: the celebrated Atalantis of Mrs Manley ſerved her for a model; and *The Court of Carimania, The new Utopia*, with ſome other pieces of a like nature, were the copies her genius produced. She alſo attempted dramatic writing and performance, but did not ſucceed in either. Whatever it was that provoked the reſentment of Pope, he gave full ſcope to it by diſtinguiſhing her as one of the prizes to be gained in the games introduced in honour of Dullneſs, in his Dunciad. Neverthele ſs, it ſeems undeniable, that there is much ſpirit, and much ingenuity, in her manner of treating ſubjects, which the friends of virtue may perhaps wiſh ſhe had never meddled with at all. But, whatever offence ſhe may have given to delicacy or morality in her early works, ſhe appears to have been ſoon convinced of, and endeavoured to atone for in the latter part of her life; as no author then appeared a greater advocate for virtue. Among her riper productions may be ſpecified, *The Female Spectator*, 4 vols; *The Hiſtory of Miſs Betty Thoughtleſs*, 4 vols. *Jemmy and Jenny Jeſſamy*, 3 vols; *The inviſible Spy*, 3 vols; with a pamphlet, entitled *A preſent for a ſervant maid.* She died in 1759.

HIAMEN, or Emouy. See Emouy.

HIATUS, properly ſignifies an opening, chaſm, or gap; but it is particularly applied to thoſe verſes where one word ends with a vowel, and the following word begins with one, and thereby occaſions the mouth to be more open, and the ſound to be very harſh.

The term *hiatus* is alſo uſed in ſpeaking of manuſcripts, to denote their defects, or the parts that have been loſt or effaced.

HIBISCUS, Syrian mallow, a genus of plants belonging to the monodelphia claſs, and in the natural method ranking under the 37th order, *Columniferæ.* See Botany *Index*.

HICETAS of Syracuſe, an ancient philoſopher and aſtronomer, who taught that the ſun and ſtars were motionleſs, and that the earth moved round them. This is mentioned by Cicero, and probably gave the firſt hint of the true ſyſtem to Copernicus. He flouriſhed 344 B. C.

HICKES, George, an Engliſh divine of extraordinary parts and learning, was born in 1642. In 1681 he was made king's chaplain, and two years after dean of Worceſter. The death of Charles II. ſtopped his farther preferment; for though his church principles were very high, he manifeſted too much zeal againſt Popery to be any favourite with James II. On the revolution, he with many others was deprived for refuſing to take the oaths to King William and Queen Mary; and ſoon after, Archbiſhop Sancroft and his colleagues conſidering how to maintain epiſcopal ſucceſſion among thoſe who adhered to them, Dr Hickes carried over a liſt of the deprived clergy to King James; and with his ſanction a private conſecration was performed, at which it is ſaid Lord Clarendon was preſent. Among others, Dr Hickes was conſecrated ſuffragan biſhop of Thetford, and died in 1715.—He wrote, 1. *Inſtitutiones Grammaticæ Anglo-Saxonicæ, et Mœſo-Gothicæ.* 2. *Antiqua literatura ſeptentrionalis.* 3. Two treatiſes, one of the Chriſtian prieſthood, the other of the dignity of the

the episcopal order. 4. Jovian, or an answer to Julian the apostate. 5. Sermons; with many temporary controversial pieces on politics and religion.

HICKUP, or HICCOUGH, a spasmodic affection of the stomach, œsophagus, and muscles subservient to deglutition, arising sometimes from some particular injury done to the stomach, œsophagus, diaphragm, &c. and sometimes from a general affection of the nervous system. See MEDICINE *Index*.

HIDAGE (*Hidagium*), was an extraordinary tax payable to the kings of England for every hide of land. This taxation was levied not only in money, but in provision, armour, &c.; and when the Danes landed in Sandwich in 994, King Ethelred taxed all his lands by hides; so that every 310 hides found one ship furnished, and every eight hides furnished one jack and one saddle, to arm for the defence of the kingdom, &c. Sometimes the word *hidage* was used for the being quit of that tax; which was also called *hidegild;* and interpreted, from the Saxon, " a price or ransom paid to save one's skin or hide from beating."

HIDALGO, in modern history, a title given in Spain to all who are of a noble family.

The Hidalgos claim a descent from those valiant soldiers who retired into Castile, and the mountains of Asturias, and other remote parts of Spain, on the invasion of the Moors, where having fortified themselves, they successively descended into the plains, in proportion to the success of their arms; from the notoriety of their persons, or the lands they became possessed of, they acquired the appellation of *Hidalgos notorios*, *Hidalgos de solar conocido*, or *de casa solariega*. Of these, according to Hernando Mexia, there are three sorts; the first being lords of places, villages, towns or castles, from whence they took their surnames, as the Guzmans, Mendozas, Laras, Guivras, and others; the second, who recovered any fortress from the Moors, as the Ponces of Leon, and others; and the third sort from the places where they resided, or held jurisdiction, as Rodrigo de Navarez was called of Antequara, from being alcayde there. But this definition is not considered as exact or conclusive by Otalora, another civilian, who says that the true meaning of *Hidalgos de solar conocido* is explained by the laws of Castile to be a well known mansion or possession, the nature of which is particularly explained in the laws of *Parditas*, lib. 5. tit. 35. which describe three sorts of tenures, called *Devisa*, *Solariega*, and *Behetria*. By the first, lands are devised by the ancestor; *solar* is a tenure upon another person's manor, and obliges the owner to receive the lord of the see when necessity obliges him to travel; and *Behetria* is in the nature of an *allodium*. In proportion as these Aborigines gained ground on the Moors, and increased in their numbers, many private persons distinguished themselves by their valour, and obtained testimonies of their services called *cartas de merced*, which served them as a foundation of their birth and good descent, without which documents their posterity could not make it appear; and if from a lapse of time, or other unavoidable accidents, such proof should happen to be lost or destroyed, the law affords them a remedy under these circumstances, by a declaration importing, that such persons as are supposed to have had such certificates, may be relieved by making it appear that their ancestors, time immemorial, have always been held and reputed as Hidalgos, and enjoyed the privileges of such, from a strong presumption in their favour; the possession of land having equal force to any other document; which is fully set forth in the *Pragmatica* of Cordova. To these executory letters are granted, *cartas executorias*, expressive of their privileges; and for the better regulation of these matters, proper officers are appointed in the chancery courts, called *alcaldes de lor hidalgos*, who ought to be *hidalgos* themselves, and hold jurisdiction in these cases, and no others; but even here innovations have taken place; for as these grants flow from the sovereign, who is the fountain of honour, some are declared *Hidalgos de sangre*, by right of descent, and others *de privilegio*, or by office, in which the will of the sovereigns has made amends for any deficiency of blood.

There is a set of people near Segovia, at a place called Zamarramala, who are exempt from tribute on account of the care they take in sending proper persons every night to the castle of Segovia to keep centinels; one cries out, *Vela*, *vela*, *hao*, and the other blows a horn, from whence they have been titled *hidalgos by the horn*. In Catalonia those gentlemen who are styled *Hombre de Pareja*, are considered the same as *hidalgos* in Castile, and were so called from the word *parejar*, to equip, this name being given as a distinction by Borela the fourth count of Barcelona, at the siege of that city, in 965, who summoning all his vassals to come to his assistance against the Moors, nine hundred horsemen well mounted and equipped joined him, and with their aid he took the city; and this appellation has been given in honourable remembrance of this loyal action.

These noble hidalgos enjoy many privileges and distinctions; of which the following are the principal:

1. The first and greatest privilege which they hold by law, is to enjoy all posts of dignity and honour in the church and state, with liberty, when churchmen, of having a plurality of benefices. They are qualified for receiving all orders of knighthood, and are to be preferred in all embassies, governments, and public commissions.

2. When they are examined as witnesses in civil and criminal cases, their depositions are to be taken in their own houses, without being obliged to quit them to go to those of others.

3. In all churches, processions, and other public acts or assemblies, they are to have the next place of honour and precedency after the officers of justice, conforming themselves to particular customs.

4. They are not obliged to accept of any challenge for combat, supposing such were allowed of, but from those who are their equals.

5. Though it is forbidden to guardians to purchase the estates of minors, this does not extend to Hidalgos, in whom the law does not suppose any fraud, and they may purchase them publicly.

6. They are permitted to be seated in courts of justice in presence of the judges, from the respect and honour due to them. They have also seats in the courts of chancery, in consideration of their birth, which gives them a right to be near the persons of princes.

7. Their perſons are free from arreſt for debt, nor can any attachment be laid on their dwelling-houſes, furniture, apparel, arms, horſes, or mules in immediate uſe: nor can they make a ceſſion of their eſtates, nor be diſtreſſed in ſuits of law, farther than their circumſtances will admit of, but are to be allowed a reaſonable and decent maintenance for their ſupport.

8. In caſes of impriſonment for criminal matters, they are to be treated differently from others. They are generally confined to their own houſes with a ſafe-guard, or under arreſt upon their honour, or allowed the city or town they live in, and in particular caſes are ſent into caſtles.

9. When puniſhments are inflicted for criminal caſes, they are to be leſs ſevere to them than to others, as they are not to ſuffer ignominious puniſhments, ſuch as public ſhame, whipping, gallies; nor are they to be hanged, but beheaded, excepting in caſes of treaſon or hereſy. In caſes that do not imply a corporal puniſhment but a pecuniary one, they are treated with more rigour, and pay a larger fine than others.

10. They are not to be put to the rack or torture, excepting for ſuch heinous crimes as are particularly ſpecified by the laws.

11. When there are title-deeds or other writings or papers in which two or more perſons have an equal right or property, and require a particular charge, they are to be given up by preference to the cuſtody of an Hidalgo, if any of the parties are ſuch.

12. The daughter of an Hidalgo enjoys every privilege of her birth, though married to a commoner; and a woman who is not an Hidalgo enjoys all theſe privileges when ſhe is a widow, following the fortune of her huſband.—But if the widow is an Hidalgo, and the late huſband was a commoner, ſhe falls into the ſtate of her huſband after his death, though ſhe had the privileges of her birth during his life.

13. They are free from all duties, called *Pechos*, *Pedidos*, *Monedas*, *Marteniegas*, *Contribuciones*, as well royal as civil, and all other levies of whatever kind they may be, with a reſerve for ſuch as are for the public benefit, in which they are equally concerned, ſuch as the repairing the highways, bridges, fountains, walls, deſtruction of locuſts, and other vermin.

14. They are free from perſonal ſervice, and from going to the wars, excepting when the king attends in perſon; even then they are not to be forced, but invited, and acquainted that the royal ſtandard is diſplayed.

15. No perſons whatever can be quartered upon, or lodged in their houſes, except when the king, queen, prince or infantes are on the road, as in ſuch caſes even the houſes of the clergy are not exempt.

16. They cannot be compelled to accept of the office of receiver of the king's rents, or any other employment which is conſidered as mean and derogatory to their dignity and rank.

17. By a particular cuſtom confirmed by royal authority, in that part of Caſtile beyond the Ebro, baſtards ſucceed to their parents, and enjoy their honours, contrary to the royal and common law.

18. If a lady, who marries a commoner, ſhould be a queen, ducheſs, marchioneſs, or counteſs (for they have no barons in Caſtile), ſhe not only does not loſe her rank, but conveys her titles to her huſband, who holds them in right of his wife.

Theſe are the general privileges which the Hidalgos enjoy; there are ſome others of leſs conſequence, as well as particular grants to certain perſons and families. An ancient and ridiculous cuſtom is ſaid to be obſerved by noble ladies who are widows of plebeians, in order to recover their birthright, for which purpoſe they carry a pack ſaddle on their ſhoulders to their huſband's grave, then throwing it down and ſtriking it three times, ſay, 'Villein, take thy villeiny, for I will abide by my nobility:' and then they recover their privileges again.

HIDE, the ſkin of beaſts; but the word is particularly applied to thoſe of large cattle, as bullocks, cows, horſes, &c.

Hides are either raw or green, juſt as taken off the carcaſe; ſalted, or ſeaſoned with ſalt, alum, and ſalt-petre, to prevent their boiling; or curried and tanned. See TANNING.

HIDE of Land, was ſuch a quantity of land as might be ploughed with one plough within the compaſs of a year, or as much as would maintain a family; ſome call it 60, ſome 80, and others 100 acres.

HIDE-Bound, a diſeaſe in the ſkin of horſes. See FARRIERY.

HIERACIUM, HAWKWEED, a genus of plants belonging to the ſyngeneſia claſs; and in the natural method ranking under the 49th order, *Compoſitæ*. See BOTANY *Index*.

HIERACITES, in church-hiſtory, Chriſtian heretics in the third century; ſo called from their leader Hierax, a philoſopher of Egypt; who taught that Melchiſedeck was the Holy Ghoſt, denied the reſurrection, and condemned marriage.

HIERANOSIS, or MORBUS SACER. See MEDICINE *Index*.

HIERA PICRA. See PHARMACY *Index*.

HIERAPOLIS, in *Ancient Geography*, a town of Phrygia, abounding in hot ſprings; and having its name from the number of its temples. There are coins exhibiting figures of various gods who had temples here. Of this place was Epictetus the Stoic philoſopher.—It is now called *Pambouk;* and is ſituated near the Scamander, on a portion of Mount Meſogis, diſtant ſix miles from Laodicea.—Its ſite appears at a diſtance as a white lofty cliff; and upon arriving at it, the view which it preſents is ſo marvellous (ſays Dr Chandler), that the deſcription of it, to bear even a faint reſemblance, ought to appear romantic. Dr Chandler's deſcription is as follows:

"The vaſt ſlope which at a diſtance we had taken for chalk, was now beheld with wonder, it ſeeming an immenſe frozen caſcade, the ſurface wavy, as of water at once fixed, or in its headlong courſe ſuddenly petrified. Round about us were many high, bare, ſtony ridges; and cloſe by our tent, one with a wide baſis, and a ſlender rill of water, clear, ſoft, and warm, running in a ſmall channel on the top. A woman was waſhing linen in it, with a child at her back; and beyond were cabins of the Turcomans, ſtanding diſtinct, much neater than any we had ſeen, each with poultry feeding, and a fence of reeds in front. *Travels in Aſia Minor*, p. 229.

"It is an old obſervation, that the country about the Mæander, Hierapolis. Mæander, the ſoil being light and friable, and full of ſalts generating inflammable matter, was undermined by fire and water. Hence it abounded in hot ſprings, which, after paſſing under-ground from the reſervoirs, appeared on the mountain, or were found bubbling up in the plain or in the mud of the river: and hence it was ſubject to frequent earthquakes; the nitrous vapour compreſſed in the cavities, and ſublimed by heat for fermentation, burſting its priſon with loud exploſions, agitating the atmoſphere, and ſhaking the earth and waters with a violence as extenſive as deſtructive; and hence, moreover, the peſtilential grottoes, which had ſubterraneous communications with each other, derived their noiſome effluvia; and ſerving as ſmaller vents to theſe furnaces or hollows, were regarded as apertures of hell, as paſſages for deadly fumes riſing up from the realms of Pluto. One or more of the mountains perhaps has burned. It may be ſuſpected, that the ſurface of the country has in ſome places been formed from its own bowels: and in particular, it ſeems probable, that the hill of Laodicea was originally an eruption."

"The hot waters of Hierapolis have produced that moſt extraordinary phenomenon, the cliff, which is one entire incruſtation. They were anciently renowned for this ſpecies of transformation. It is related, they changed ſo eaſily, that being conducted about the vineyards and gardens, the channels became long fences, each a ſingle ſtone. They produced the ridges by our tent. The road up to the ruins, which appears as a wide and high cauſeway, is a petrification; and overlooks many green ſpots, once vineyards and gardens, ſeparated by partitions of the ſame material. The ſurface of the flat, above the cliff, is rough with ſtone and with channels, branching out in various directions, a large pool overflowing and feeding the numerous rills, ſome of which ſpread over the ſlope as they deſcend, and give to the white ſtony bed a humid look, reſembling ſalt or driven ſnow when melting. This cruſt, which has no taſte or ſmell, being an alkaline ſubſtance, will ferment with acids; and Picerini relates, that trial of it had been made with ſpirit of vitriol. The waters, though hot, were uſed in agriculture.

This cruſt is probably lime.

"Tamerlane, when he invaded this country, encamped for the ſummer at Tanguzlik, where many of his men were deſtroyed by drinking of a ſpring which ſtagnated and petrified. The Turkiſh name Pambouk ſignifies *cotton*; and, it has been ſaid, refers to the whiteneſs of the incruſtation.

"The ſhepherd-poet of Smyrna, after mentioning a cave in Phrygia ſacred to the Nymphs, relates, that there Luna had once deſcended from the ſky to Endymion, while he was ſleeping by his herds; that marks of their bed were then extant under the oaks; and that in the thickets around it the milk of cows had been ſpilt, which men ſtill beheld with admiration (for ſuch was the appearance if you ſaw it very far off); but that from thence flowed clear or warm water, which in a little while concreted round about the channels, and formed a ſtone pavement. The writer deſcribes the cliff of Hierapolis, if I miſtake not, as in his time; and has added a local ſtory, current when he lived. It was the genius of the people to unite fiction with truth; and, as in this and other inſtances, to dignify the tales of their mythology with fabulous evidence taken from the natural wonders in which their country abounded.

Hierapolis.

"We aſcended in the morning to the ruins, which are on a flat, paſſing by ſepulchres with inſcriptions, and entering the city from the eaſt. We had ſoon the theatre on our right hand, and the pool between us and the cliff. Oppoſite to it, near the margin of the cliff, are the remains of an amazing ſtructure, once perhaps baths, or, as we conjectured, a gymnaſium; the huge vaults of the roof ſtriking horror as we rode underneath. Beyond it is the mean ruin of a modern fortreſs; and farther on are maſſive walls of edifices, ſeveral of them leaning from their perpendicular, the ſtones diſtorted, and ſeeming every moment ready to fall; the effects and evidences of violent and repeated earthquakes. In a receſs of the mountain on the right hand is the area of a ſtadium. Then again ſepulchres ſucceed, ſome nearly buried in the mountain-ſide, and one, a ſquare building, with an inſcription in large letters. All theſe remains are plain, and of the ſtone created by the waters. The ſite has been computed about two hundred paces wide and a mile in length.

"After taking a general ſurvey, we returned to the theatre, intending to copy inſcriptions, and examine more particularly as we changed our ſtation. We found this a very large and ſumptuous ſtructure, and the leaſt ruined of any we had ſeen. Part of the front is ſtanding. In the heap which lies in confuſion, are many ſculptures well executed in baſſo relievo: with pieces of architrave inſcribed, but disjoined; or ſo encumbered with maſſive marbles, that we could collect from them no information. The character is large and bold, with ligatures. The marble ſeats are ſtill unremoved. The numerous ranges are divided by a low ſemicircular wall, near mid way, with inſcriptions on the face of it, but moſt illegible. I copied a ſhort but imperfect one, in which Apollo Archegetes or *The Leader* is requeſted to be propitious. In another compartment, mention is made of the city by its name *Hierapolis*; and on a third is an encomium in verſe, which may be thus tranſlated, "Hail, golden city Hierapolis, the ſpot to be preferred before any in wide Aſia; revered for the rills of the Nymphs; adorned with ſplendor." The Nymphs preſided over ſprings and fountains.

"After attentively viewing them, and conſidering their height, width, and manner of arrangement, I am inclined to believe, that the ancient Aſiatics ſat at their plays and public ſpectacles like the modern, with their legs croſſed or gathered under them; and it is probable upon carpets.

"The waters of Hierapolis were ſurpriſingly attempered for tinging wool, with a colour from roots rivalling the more coſtly purples; and were a principal ſource of the riches of the place. The company of dyers is mentioned in the inſcription on the ſquare building among the ſepulchres. The heroum or monument was to be crowned by them with garlands or feſtoons of flowers. The ſprings flowed ſo copiouſly, that the city was full of ſpontaneous baths; and Apollo, the tutelar deity of the Hierapolitans, with Æſculapius and Hygiéa, on their medals, bear witneſs to the medicinal virtues which they poſſeſs. The people, in ſome of their inſcriptions, are ſtyled the *moſt ſplendid*, and the ſenate the *moſt powerful*.

"The-

"The pool before the theatre has been a bath, and marble fragments are visible at the bottom of the water, which is perfectly transparent, and of a briny taste.

"Hierapolis was noted, besides its hot waters, for a plutonium. This was an opening in a small brow of the adjacent mountain, capable of admitting a man, and very deep, with a square fence before it, inclosing about half an acre; which space was filled with black thick mist, so that the bottom could be scarcely discerned. The air, to those who approached it, was innocent on the outside of the fence, being clear of the mist in serene weather, it remaining then within the boundary; but there death abode. Bulls, as at Nysa, dropt down, and were dragged forth without life; and some sparrows which Strabo let fly instantly fell senseless. But eunuchs, the priests of Magna Mater, or Cybele, could go in quite to the aperture, lean forward, or enter it unharmed; but they held their breath, as their visages testified, and sometimes until in danger of suffocation. Strabo, the relater, was in doubt whether all eunuchs could do this, or only they of the temple; and whether they were preserved by Divine Providence, as in cases of enthusiasm, or were possessed of some powerful antidotes. But it is likely this mist was the condensed steam of the hot waters, made noxious by the qualities of the soil; and that the whole secret of the priests consisted in carrying their faces high in the air, as another spectator has observed they always did; and in avoiding respiration when they stooped. I had hoped the description of this spot would have enabled me to find it, but I searched about for it unsuccessfully.

"We descended to our tent at the approach of evening by a steep track down the cliff, beginning beyond the pool, in which we also bathed with pleasure, on the side next the gymnasium. Our way was often rough and slippery, resembling ice, and our horses with difficulty preserved their footing. When arrived at our tent, I renewed my inquiries for the plutonium; and an old Turk, with a beard as white as snow, told me he knew the place, that it was often fatal to their goats; and accounting for the effect, said, it was believed to be the habitation of a dæmon or evil spirit. We ascended again early in the morning to the theatre, where he had promised to join us; and a live fowl was intended to be the martyr of experiment." But our author was interrupted by some banditti, and obliged to leave Hierapolis in haste.

HIERARCHY, among divines, denotes the subordination of angels.

Some of the rabbins reckon four, others ten, orders or ranks of angels; and give them different names according to their different degrees of power and knowledge.

HIERARCHY, likewise denotes the subordination of the clergy, ecclesiastical polity, or the constitution and government of the Christian church considered as a society.

HIERES, the name of some small islands lying near the coast of Provence in France, opposite to the towns of Hieres and Toulon, where the English fleet lay many months in 1744, and blocked up the French and Spanish fleets in the harbour of Toulon.

HIERES, a town of Provence in France, seated on the Mediterranean sea. It is a pretty little town, and was formerly a colony of the Marsilians; and pilgrims used to embark here for the holy land. But its harbour being now choaked up, it is considerable only for its salt-works. E. Long. 6. 13. N. Lat. 43. 7.

HIERO I. and II. kings of Syracuse. See SYRACUSE.

HIEROCLES, a cruel persecutor of the Christians and a violent promoter of the persecution under Dioclesian, flourished in 302. He wrote some books against the Christian religion; in which he pretends some inconsistencies in the Holy Scriptures, and compares the miracles of Apollonius Tyanæus to those of our Saviour. He was refuted by Lactantius and Eusebius. The remains of his works were collected into one volume octavo, by Bishop Pearson; and published in 1654, with a learned dissertation prefixed to the work.

HIEROCLES, a Platonic philosopher of the fifth century, taught at Alexandria, and was admired for his eloquence. He wrote seven books upon Providence and Fate: and dedicated them to the philosopher Olympiodorus, who by his embassies did the Romans great service under the emperors Honorius and Theodosius the younger. But these books are lost, and we only know them by the extracts in Photius. He wrote also a Commentary upon the golden verses of Pythagoras; which is still extant, and has been several times published with those verses.

HIEROGLYPHICS, in antiquity, mystical characters, or symbols, in use among the Egyptians, and that as well in their writings as inscriptions; being the figures of various animals, the parts of human bodies, and mechanical instruments. The word is composed of the Greek ἱερος *sacer*, "holy," and γλυφειν *sculpere*, "to engrave;" it being the custom to have the walls, doors, &c. of their temples, obelisks, &c. engraven with such figures.

Hieroglyphics are properly emblems or signs of divine, sacred, or supernatural things; by which they are distinguished from common symbols, which are signs of sensible and natural things.

Hermes Trismegistus is commonly esteemed the inventor of hieroglyphics: he first introduced them into the heathen theology, from whence they have been transplanted into the Jewish and Christian.

Sacred things, says Hippocrates, should only be communicated to sacred persons. Hence it was that the ancient Egyptians communicated to none but their kings and priests, and those who were to succeed to the priesthood and the crown, the secrets of nature, and the secrets of their morality and history; and this they did by a kind of cabbala, which, at the same time that it instructed them, only amused the rest of the people. Hence the use of hieroglyphics, or mystic figures, to veil their morality, politics, &c. from profane eyes. This author, it may be observed, and many others, do not keep to the precise character of a hieroglyphic, but apply it to profane as well as divine things.

Hieroglyphics are a kind of real character, which do not only denote, but in some measure express, the things. Thus, according to Clemens Alexandrinus, Strom. v. a lion is the hieroglyphic of strength and fortitude; a bullock, of agriculture; a horse, of liberty; a sphinx, of subtilty, &c.

Such

Such is the opinion that has generally been embraced, both by ancient and modern writers, of the origin and uſe of hieroglyphics. It has been almoſt uniformly maintained, that they were invented by the Egyptian prieſts in order to conceal their wiſdom from the knowledge of the vulgar; but the late Biſhop Warburton hath, with much ingenuity and learning, endeavoured to ſhow that this account is erroneous.

According to this writer, the firſt kind of hieroglyphics were mere pictures, becauſe the moſt natural way of communicating our conceptions by marks or figures was by tracing out the images of things; and this is actually verified in the caſe of the Mexicans, whoſe only method of writing their laws and hiſtory was by this picture-writing. But the hieroglyphics invented by the Egyptians were an improvement on this rude and inconvenient eſſay towards writing, for they contrived to make them both pictures and characters. In order to effect the improvement, they were obliged to proceed gradually, by firſt making the principal circumſtance of the ſubject ſtand for the whole; as in the hieroglyphics of Horapollo, which repreſent a battle of two armies in array by two hands, one holding a ſhield and the other a bow: then putting the inſtrument of the thing, whether real or metaphorical, for the thing itſelf, as an eye and ſceptre to repreſent a monarch, a ſhip and pilot the governor of the univerſe, &c.: and finally, by making one thing ſtand for or repreſent another, where their obſervations of nature or traditional ſuperſtitions led them to diſcover or imagine any reſemblance: thus, the univerſe was deſigned by a ſerpent in a circle, whoſe variegated ſpots denoted the ſtars; and a man who had nobly ſurmounted his misfortune was repreſented by the ſkin of the hyæna, becauſe this was ſuppoſed to furniſh an invulnerable defence in battle.

The Chineſe writing, he obſerves, was the next kind of improvement in the uſe of hieroglyphics. The Egyptians joined characteriſtic marks to images; the Chineſe threw out the images and retained only the contracted marks, and from theſe marks proceeded letters. The general concurrence of different people in this method of recording their thoughts can never be ſuppoſed to be the effect of imitation, ſiniſter views, or chance; but muſt be conſidered as the uniform voice of nature ſpeaking to the rude conceptions of mankind: for not only the Chineſe of the Eaſt, the Mexicans of the Weſt, and the Egyptians of the South, but the Scythians likewiſe of the North, and the intermediate inhabitants of the earth, viz. the Indians, Phœnicians, Ethiopians, &c. uſed the ſame way of writing by picture and hieroglyphic.

The biſhop farther ſhows, that the ſeveral ſpecies of hieroglyphic writing took their riſe from nature and neceſſity, and not from choice and artifice, by tracing at large the origin and progreſs of the art of ſpeech. He proceeds to ſhow how in proceſs of time the Egyptian hieroglyphics came to be employed for the vehicle of myſtery. They uſed their hieroglyphics two ways; the one more ſimple, by putting the part for the whole, which was the curiologic hieroglyphic; and the other more artificial, by putting one thing of reſembling qualities for another, called the *tropical hieroglyphic*: thus the moon was ſometimes repreſented by a half circle and ſometimes by a cynocephalus. They employed their proper hieroglyphics to record openly and plainly their laws, policies, public morals, and hiſtory, and all kinds of civil matters: this is evident from their obeliſks, which are full of hieroglyphic characters, deſigned to record ſingular events, memorable actions, and new inventions; and alſo from the celebrated inſcription on the temple of Minerva, at Sais, where an infant, an old man, a hawk, a fiſh, and a river-horſe, expreſſed this moral ſentence: "All you who come into the world and go out of it, know this, that the gods hate impudence." However, the tropical hieroglyphics, which were employed to divulge, gradually produced ſymbols which were deſigned to ſecrete or conceal: thus Egypt was ſometimes expreſſed by the crocodile, ſometimes by a burning cenſer with a heart upon it; where the ſimplicity of the firſt repreſentation and the abſtruſeneſs of the latter ſhow, that the one was a tropical hieroglyphic for communication, and the other a tropical ſymbol invented for ſecrecy.

Enigmatic ſymbols were afterwards formed by the aſſemblage of different things, or of their properties that were leſs known; and though they might have been intelligible at firſt; yet when the art of writing was invented, hieroglyphics were more generally diſuſed, the people forgot the ſignification of them, and the prieſts, retaining and cultivating the knowledge of them becauſe they were the repoſitories of their learning and hiſtory, at length applied them to the purpoſe of preſerving the ſecrets of their religion.

Symbols were the true original of animal-worſhip in Egypt, as Sir John Marſham conjectures, *Can. Chron.* p. 58. becauſe in theſe hieroglyphics was recorded the hiſtory of their greater deities, their kings, and lawgivers, repreſented by animals and other creatures. The ſymbol of each god was well known and familiar to his worſhippers, by means of the popular paintings and engravings on their temples and other ſacred monuments; ſo that the ſymbol preſenting the idea of the god, and that idea exciting ſentiments of religion, it was natural for them, in their addreſſes to any particular god, to turn to his repreſentative mark or ſymbol; eſpecially when we conſider farther, that the Egyptian prieſts feigned a divine original for hieroglyphic characters, in order to increaſe the veneration of the people for them. Theſe would of courſe bring on a relative devotion to theſe ſymbolic figures, which, when it came to be paid to the living animal, would ſoon terminate in an ultimate worſhip.

Another conſequence of the ſacredneſs of the hieroglyphic characters was, that it diſpoſed the more ſuperſtitious to engrave them on gems, and wear them as amulets or charms. This magical abuſe ſeems not to have been much earlier than the eſtabliſhed worſhip of the god Serapis, which happened under the Ptolemies, and was firſt brought to the general knowledge of the world by certain Chriſtian heretics and natives of Egypt, who had mixed a number of Pagan ſuperſtitions with their Chriſtianity. Theſe gems, called *abraxas*, are frequently to be met with in the cabinets of the curious, and are engraven with all kinds of hieroglyphic characters. To theſe abraxas ſucceed the taliſmans.

HIEROGRAMMATISTS, (*Hierogrammatei*), i. e. *holy regiſters*, were an order of prieſts among the ancient

ancient Egyptians, who presided over learning and religion. They had the care of the hieroglyphics, and were the expositors of religious doctrines and opinions. They were looked upon as a kind of prophets; and it is pretended, that one of them predicted to an Egyptian king, that an Israelite (meaning Moses), eminent for his qualifications and atchievements, would lessen and depress the Egyptian monarchy.—The hierogrammatei were always near the king, to assist him with their informations and counsels. The better to fit them for this, they made use of the skill and knowledge they had acquired in the stars and the motions of the heavenly bodies, and even of the writings of their predecessors, wherein their functions and duties were delivered. They were exempted from all civil employments, were reputed the first persons in dignity next the king, and bore a kind of sceptre in form of a ploughshare.——After Egypt became a province of the Roman empire, the hierogrammatei sunk into neglect.

HIEROMANCY, in antiquity, that part of divination which predicted future events from observing the various things offered in sacrifice. See DIVINATION and SACRIFICE.

HIEROMNEMON, among the ancient Greeks, signified a delegate chosen by lot, and sent to the great council of the Amphictyons, where he was to take care of what concerned religion. The hieromnemonies were reckoned more honourable than the other members of that assembly, the general meetings of which were always summoned by them, and their names were prefixed to the decrees made by that council.

HIEROMNEMON (composed of ἱερος "sacred," and μνημων "one who advertises or puts in mind of)," an officer in the ancient Greek church, whose principal function was to stand behind the patriarch at the sacraments, ceremonies, &c. and show him the prayers, psalms, &c. which he was to rehearse. He also clothed the patriarch in his pontifical robes, and assigned the places of all those who had a right to be around him when seated on his throne, as the master of the ceremonies now does to the pope.

HIERONYMUS. See JEROME.

HIEROPHANTES, or HIEROPHANTA, (from ἱερος *holy*, and φαινομαι *I appear*), in antiquity, a priest among the Athenians.

The hierophantes was properly the chief person that officiated in the Eleusinia, that great solemnity sacred to Ceres.

This office was first executed by Eumolpus, and continued in his family for 1200 years, though when any person was appointed to this dignity he was required always to live in celibacy.

St Jerome says, that the hierophantes extinguished the fire of lust by drinking cicuta or the juice of hemlock, or even by making themselves eunuchs. Apollodorus observes, that it was the hierophantes who instructed persons initiated into their religion in the mysteries and duties thereof, and that it was hence he derived his name: for the same reason he was called *prophetes*, "the prophet." He had officers under him to do the same thing, or to assist him therein, who were also called *prophetes* and *exeges*, i. e. "explainers of divine things."

To the hierophantes it belonged to dress and adorn the statues of the gods, and to bear them in processions and solemn ceremonies.

HIEROPHYLAX, an officer in the Greek church who was guardian or keeper of the holy utensils, vestments, &c. answering to our sacrista or vestry-keeper.

HIGH, a term or relation, importing one thing's being superior or above another: thus we say, a *high* mountain, the *high* court of parliament, *high* relievo, &c.

HIGH, in music, is sometimes used in the same sense with *loud*, and sometimes in the same sense with *acute*.

HIGH Dutch, is the German tongue in its greatest purity, &c. as spoken in Misnia, &c.

HIGH Operation, in chirurgery, is a method of extracting the stone; thus called, because the stone is taken out at the upper part of the bladder. See SURGERY.

HIGH Places, were eminences on which the heathens used to worship their gods, chosen for that purpose as being supposed to be nearer heaven their constant residence. The Jews are frequently blamed for their attachment to high-places, after the manner of the Gentiles; though their *proseuchæ* were frequently upon mountains with groves planted about them. Where high-places are reprobated in scripture, therefore, we should understand them as abused and prostituted to idolatrous purposes. Before the temple was built, there was indeed nothing in the high-places very contrary to the law, provided God only was adored there, and that no incense or victims were offered to idols. Under the judges they seem to have been tolerated; and Samuel offered sacrifices in several places besides the tabernacle, where the ark was not present. Even in David's time, they sacrificed to the Lord at Shilo, Jerusalem, and Gibeon; but after the temple was built, and a place prepared for the fixed settlement of the ark, it was no more allowed of to sacrifice out of Jerusalem. Solomon, in the beginning of his reign, went a pilgrimage to Gibeon; but from that time we see no lawful sacrifices offered out of the temple.

HIGH Priest. See PONTIFEX and PRIEST.

HIGH Way, a free passage for the king's subjects: on which account it is called *the king's high way*, though the freehold of the soil belong to the owner of the land. Those ways that lead from one town to another, and such as are drift or cart ways, and are for all travellers in great roads, or that communicate with them, are high ways only; and as to their reparation, are under the care of surveyors.

HIGH-WAY-MEN, are robbers on the high way; for the apprehending and taking of whom, a reward of 40l. is given by the statute of 4 and 5 W. and M. to be paid within a month after conviction by the sheriff of the county; to which the statute 8 Geo. II. cap. 6. superadds 10l. to be paid by the hundred indemnified by such taking.

HIGHAM FERRERS, an ancient borough of Northamptonshire in England, which has its name from the family of the Ferrers, to whom it formerly belonged, and who had a castle in its neighbourhood. It sends one member to parliament. E. Long. 1. 40. N. Lat. 52. 20.

HIGHGATE, a village five miles north of London. It has its name from its high situation, and from a a gate set up there about 400 years ago, to receive toll for the bishop of London, when the old miry road from Gray's-Inn lane to Barnet was turned through the bishop's park. There was a hermitage where the chapel now stands; and one of the hermits caused a causeway to be made between Highgate and Islington, with gravel dug out of the top of the hill, where there is now a pond. Near the chapel, in 1562, lord chief baron Cholmondely built and endowed a free school, which was enlarged in 1570 by Edwin Sandys bishop of London.—This village is a noted and airy retirement for the gentry and wealthy citizens; and is a place of good accommodation, besides its affording a delightful and pleasant prospect over the city and adjacent country.

HIGHLANDERS, a general appellation for the inhabitants of the mountainous parts of any country. In Britain, the name is appropriated to the people who inhabit the mountainous parts of Scotland, to the north and north-west, including those of the Hebrides or Western isles.—They are a branch of the ancient Celtæ; and undoubtedly the descendants of the first inhabitants of Britain, as appears from the many monuments of their language still retained in the most ancient names of places in all parts of the island. The Highlanders, or, as they are often termed by ancient authors, the *Caledonians*, were always a brave, warlike, and hardy race of people; and, in the remotest times, seem to have possessed a degree of refinement in sentiment and manners then unknown to the other nations that surrounded them. This appears not only from their own traditions and poems, but also from the testimony of many ancient authors. This civilization was probably owing in a great measure to the order of the bards, or Druids, and some other institutions peculiar to this people,

The ancient Highlanders lived in the hunting state till some time after the era of Fingal, who was one of their kings towards the close of the third century. For some ages after that, they turned their chief attention to the pastoral life, which afforded a less precarious subsistence. Till of late, agriculture in most parts of the Highlands made but little progress.

The Highlanders always enjoyed a king and government of their own, till Kenneth M'Alpine (anno 845), after having subdued the Pictish kingdom, transferred thither the seat of royalty. This event proved very unfavourable to the virtues of the Highlanders, which from this period began to decline. The country, no longer awed by the presence of the sovereign, fell into anarchy and confusion. The chieftains began to extend their authority, to form factions, and to foment divisions and feuds between contending clans. The laws were either too feeble to bind them, or too remote to take notice of them. Hence sprung all those evils which long disgraced the country, and disturbed the peace of its inhabitants. Robbery or plunder, providing it was committed on any one of an adverse clan or tribe, was countenanced and authorised; and their reprisals on one another were perpetual. Thus quarrels were handed down from one generation to another, and the whole clan were bound in honour to espouse the cause of every individual that belonged to it. By this means the genius of the people was greatly altered; and the Highlanders of a few ages back were almost as remarkable for their irregular and disorderly way of life as their predecessors were for their civilization and virtue. It is from not attending to this distinction between the ancient Highlanders and their posterity in later times, that many have doubted the existence of those exalted virtues ascribed by their poets to the more ancient inhabitants of the country. But now that the power of the chieftains is again abolished, law established, and property secured, the genius of the people (where it is not hindered by some other extraneous cause) begins again to show itself in its genuine colours; and many of their ancient virtues begin to shine with conspicuous lustre. Justice, generosity, honesty, friendship, peace, and love, are perhaps nowhere more cultivated than among this people. But one of the strongest features which marked the character of the Highlanders in every age, was their hospitality and benevolence to strangers. At night the traveller was always sure to find a hearty welcome in whatever house he should go to; and the host thought himself happier in giving the entertainment than the guest in receiving it. Even with regard to their enemies, the laws of hospitality were observed with the most sacred regard. They who fought against each other in the day, could in the night feast, and even sleep together, in the same house. From the same principle, they were, in most other cases, so faithful to their trust, that they rarely betrayed any confidence reposed in them. A promise they thought as binding as an oath, and held it equally inviolable and sacred.

The Caledonians in all ages have been much addicted to poetry and music. The poems of Ossian, so universally repeated, and so highly esteemed by every Highlander, are a strong proof of the early proficiency of this people in the poetical art. Even to this day, notwithstanding the many disadvantages they labour under, the most illiterate of either sex discover frequently a genius for poetry, which often breaks forth in the most natural and simple strains, when love, grief, joy, or any other subject of song, demands it. Wherever their circumstances are so easy as to allow them any respite from toil, or any cheerfulness of spirits, a good portion of their time, especially of the winter-nights, is still devoted to the song and tale. This last species of composition is chiefly of the novel-kind, and is handed down by tradition like their poems. It was the work of the bards; and proved, while they existed, no contemptible entertainment. But since the extinction of that order, both the Gaelic poems and tales are in a great measure either lost or adulterated.—The genius and character of the Gaelic poetry is well known. It is tender, simple, beautiful, and sublime.

Among the ancient Highlanders, the harp was the chief instrument of music. It suited the mildness of their manners, and was well adapted to the peace and quiet which they enjoyed under their own kings. In a later period, however, when the constant quarrels of their chiefs, and the endless feuds of contending clans, turned all their thoughts to war, it was forced to give place to the bag-pipe, an instrument altogether of the martial kind, and therefore well suited to the state of the country at that time. But ever since the cause which had brought this instrument in vogue has ceased to

Highlanders.

to operate, the attention to it has been on the decline; so that the harp, with very little encouragement, might again resume the seat from which it was once expelled. —The most, and especially the oldest of the Highland music, having been composed to the harp, is of a soft, tender, and elegiac cast, as best suited to the genius of that instrument. These pieces are generally expressive of the passions of love and grief. Other pieces, which were composed in their state of war, and adapted to a different instrument, are altogether bold and martial. And many are of a sprightly and cheerful cast, the offspring of mirth, and the sport of fancy in the season of festivity. Many of these last are of the chorus kind: and are sung in almost all the exercises in which a number of people are engaged, such as rowing, reaping, fulling, &c. The time of these pieces is adapted to the exercises to which they are respectively sung. They greatly forward the work, and alleviate the labour. The particular music which is generally used by the Highlanders in their dances is well known by the name of *Strathspey reels*.

The language of the Highlanders is still the Gaelic; which, with many of their customs and manners, has been secured to them by their mountains and fastnesses, amidst the many revolutions which the rest of the island has undergone in so long a course of ages. The Gaelic seems to be the oldest and purest dialect which remains of the Celtic, as appears from its approaching the nearest to the names of places, &c. which that language left in most countries where it prevailed, and from its most obvious affinity to those tongues, ancient or modern, which have been in any measure derived from the old Celtic. The Gaelic has all the marks of an original and primitive language. Most of the words are expressive of some property or quality of the objects which they denote. This, together with the variety of its sounds (many of which, especially of those that express the soft and mournful passions, are peculiar to itself), renders it highly adapted for poetry. It is generally allowed to have been the language of court, in Scotland, till the reign of Malcolm Canmore. The Gaelic epithet of *Can-more*, or "large head," by which this king is distinguished, seems to intimate so much. In some particular parliaments at least, it was spoken much later, as in that held by Robert the Bruce at Ardchattan. That it has been formerly a good deal cultivated, appears from the style and complexion of its poems and tales, and from several ancient MSS. that have come down to the present time. To strangers the Gaelic has a forbidding aspect, on account of the number of its quiescent consonants (which are retained to mark the derivation of words and their variation in case and tense), but its sound is abundantly musical and harmonious; and its genius strong and masculine. Its alphabet consists of 18 letters, of which one is an aspirate, 12 are consonants, and five are vowels.

The Highlanders are beginning of late to apply to learning, agriculture, and especially to commerce, for which their country, everywhere indented with arms of the sea, is peculiarly favourable. Cattle is the chief staple of the country; but it produces more grain than would supply its inhabitants, if so much of it were not consumed in whisky. The natives are beginning to avail themselves of their mines, woods, wool, and fisheries; and by a vigorous application, with the due encouragement of government, may become a prosperous and useful people.

The Highlanders are of a quick and penetrating genius, strongly tinctured with a curiosity or thirst of knowledge, which disposes them to learn any thing very readily. They are active and industrious, where oppression does not discourage them by secluding even the hope of thriving. They are remarkably bold and adventurous, which qualifies them for being excellent seamen and soldiers. They are generally of a middle size, rather above it than otherwise; their eyes are brisk and lively, their features distinctly marked, and their persons tight and well made. Their countenance is open and ingenuous, and their temper frank and communicative.

Highmore.

HIGHMORE, Joseph, Esq. an eminent painter, was born in the parish of St James's, Garlickhithe, London, June 13. 1692, being the third son of Mr Edward Highmore, a coal-merchant in Thames-street. Having such an early and strong inclination to painting, that he could think of nothing else with pleasure, his father endeavoured to gratify him in a proposal to his uncle, who was serjeant-painter to King William, and with whom Mr (afterwards Sir James) Thornhill had served his apprenticeship. But this was afterwards for good reasons declined, and he was articled as clerk to an attorney, July 18th 1707; but so much against his own declared inclination, that in about three years he began to form resolutions of indulging his natural disposition to his favourite art, having continually employed his leisure hours in designing, and in the study of geometry, perspective, architecture, and anatomy, but without any instructors except books. He had afterwards an opportunity of improving himself in anatomy, by attending the lectures of Mr Cheselden, besides entering himself at the painters academy in Great Queen-street, where he drew 10 years, and had the honour to be particularly noticed by Sir Godfrey Kneller, who distinguished him by the name of "the Young Lawyer." On June 13th 1714, his clerkship expired; and on March 26th 1715, he began painting as a profession, and settled in the city. In the same year Dr Brook Taylor published his "Linear Perspective: or, a new method of representing justly all manner of objects as they appear to the eye in all situations." On this complete and universal theory our artist grounded his subsequent practice; and it has been generally allowed, that few, if any, of the profession at that time were so thorough masters of that excellent but intricate system. In 1716, he married Miss Susanna Hiller, daughter and heiress of Mr Anthony Hiller of Effingham in Surrey; a young lady in every respect worthy of his choice. For Mr Cheselden's "Anatomy of the Human body," published in 1722, he made drawings from the real subjects at the time of dissection, two of which were engraved for that work, and appear, but without his name, in tables xii. and xiii. In the same year, on the exhibition of "The Conscious Lovers," written by Sir Richard Steele, Mr Highmore addressed a letter to the author on the limits of filial obedience, pointing out a material defect in the character of Bevil, with that clearness and precision for which, in conversation and writing, he was always remarkable, as the pencil by no means

Highmore. means engroffed his whole attention. His reputation and bufinefs increafing, he took a more confpicuous ftation, by removing to a houfe in Lincoln's-Inn Fields, in March 1723-4; and an opportunity foon offered of introducing him advantageoufly to the nobility, &c. by his being defired, by Mr Pine the engraver, to make the drawings for his prints of the knights of the bath, on the revival of that order in 1725. In confequence, feveral of the knights had their portraits alfo by the fame hand, fome of them whole lengths; and the duke of Richmond, in particular, was attended by his three efquires, with a perfpective view of King Henry VIIth's chapel. This capital picture is now at Godwood. And our artift was fent for to St James's by George I. to draw the late duke of Cumberland, from which Smith fcraped a mezzotinto.

In 1728, Mr Hawkins Browne, then of Lincoln's-Inn, who had ever a juft fenfe of his talents and abilities, addreffed to him a poetical epiftle "On Defign and Beauty;" and, fome years after, an elegant Latin Ode, both now collected in his poems. In the fummer of 1732, Mr Highmore vifited the continent, in company with Dr Pemberton, Mr Benjamin Robins, and two other friends, chiefly with a view of feeing the gallery of pictures belonging to the elector Palatine at Duffeldorp, collected by Rubens, and fuppofed the beft in Europe. At Antwerp alfo he had peculiar pleafure in contemplating the works of his favourite mafter. In their return they vifited the principal towns in Holland. In 1734, he made a like excurfion, but alone, to Paris, where he received great civilities from his countrymen then there, particularly the duke of Kingfton, Dr Hickman (his tutor), Robert Knight, Efq. (the late cafhier), &c. Here he had the fatisfaction of being fhown, by Cardinal de Polignac, his famous group of antique ftatues, the court of Lycomedes, then juft brought from Rome, and fince purchafed by the king of Pruffia, and deftroyed at Charlottenbourg in 1760 by the Ruffians. In 1742, he had the honour to paint the late prince and princefs of Wales for the duke of Saxe Gotha; as he did fome years after the late queen of Denmark for that court. The publication of "Pamela," in 1744, gave rife to a fet of paintings by Mr Highmore, which were engraved by two French engravers, and publifhed by fubfcription in 1745. In the fame year he painted the only original of the late General Wolfe, then about 18. His Pamela introduced him to the acquaintance and friendfhip of the excellent author whofe picture he drew, and for whom he painted the only original of Dr Young. In 1750 he had the misfortune to lofe his wife. On the firft inftitution of the academy of painting, fculpture, &c. in 1753, he was elected one of the profeffors; an honour which, on account of his many avocations, he defired to decline. In 1754 he publifhed "A critical examination of thofe two Paintings [by Rubens] on the Ceiling of the Banqueting-houfe at Whitehall, in which Architecture is introduced, fo far as relates to Perfpective; together with the Difcuffion of a Queftion which has been the Subject of Debate among Painters:" printed in 4to. In the folution of this queftion, he proved that Rubens and feveral other great painters were miftaken in the practice, and Mr Kirby and feveral other authors in the theory. And in the 17th volume of the "Monthly Review," he animadverted (anonymoufly) on Mr Kirby's unwarrantable treatment of Mr Ware, and detected and expofed his errors, even when he exults in his own fuperior fcience. Of the many portraits which Mr Highmore painted, in a large practice of 46 years (of which feveral have been engraved), it is impoffible and ufelefs to difcufs particulars. Some of the moft capital in the hiftorical branch, which was then much lefs cultivated than it is at prefent, fhall only be mentioned, viz. "Hagar and Ifhmael," a prefent to the Foundling-hofpital: "The good Samaritan," painted for Mr Shepherd of Campfey Afh: "The finding of Mofes," purchafed at his fale by Colonel (now General) Lifter: "The Harlowe family, as defcribed in Clariffa," now in the poffeffion of Thomas Watkinfon Payler, Efq. at Heden in Kent: "Clariffa," the portrait mentioned in that work: "The Graces unveiling Nature," drawn by memory from Rubens: "The Clementina of Grandifon, and the queen mother of Edward IV. with her younger fon, &c. in Weftminfter-abbey;" the three laft in the poffeffion of his fon.

In 1761, on the marriage of his daughter to the reverend Mr Duncombe, fon to one of his oldeft friends, he took a refolution of retiring from bufinefs, and difpofing of his collection of pictures, which he did by auction, in March 1762, and foon after removed to his fon-in-law's at Canterbury, where he paffed the remainder of his life without ever revifiting the metropolis. But though he had laid down the pencil, he never wanted employment: fo active and vigorous was his mind, that, with a conftitutional flow of fpirits, and a relifh for inftructive fociety, he was never lefs "alone than when alone;" and, befides his profeffional purfuits above mentioned, to philofophy, both natural and moral, and alfo divinity, he laudably dedicated his time and attention. No man had more clearnefs and precifion of ideas, or a more ardent defire to know the truth; and, when known, confcientioufly to purfue it. With ftrong paffions, ever guided by the ftricteft virtue, he had a tender, fufceptible heart, always open to the diftrefs of his fellow-creatures, and always ready to relieve them. His capital work of the literary kind was his "Practice of perfpective, on the principles of Dr Brook Taylor, &c." written many years before, but not publifhed till 1763, when it was printed for Nourfe, in one vol. 4to. This not only evinced his fcientific knowledge of the fubject, but removed, by its perfpicuity, the only objection that can be made to the fyftem of Dr Taylor. It accordingly received, from his friends and the intelligent public, the applaufes it deferved. In 1765 he publifhed (without his name) Obfervations on a Pamphlet entitled, "Chriftianity not founded on Argument;" in which, after fhowing that it is a continued irony, and lamenting that fo ample a field fhould be offered the author of it for the difplay of his fophiftry; he gives up creeds, articles, and catechifms, as out-works raifed by fallible men, and, confining himfelf to the defence of the gofpel, or citadel, fhows, that pure primitive Chriftianity, though affaulted by infidels, will ever remain impregnable. His opinion of Rubens may be seen in the Gentleman's Magazine for 1766, p. 353, under the title of "Remarks on some passages in Mr Webb's inquiry into the Beauties of painting, &c." In the same year he published, with only his initials, "J. H." two small volumes of "Essays, moral, religious, and and miscellaneous; with a Translation in prose of Mr Browne's Latin Poem on the Immortality of the Soul:" selected from a large number written at his leisure, at different periods of life. "As such (says Dr Hawkesworth) they do the author great credit. They are not excursions of fancy, but efforts of thought, and indubitable indications of a vigorous and active mind." In the Gentleman's Magazine for 1769, p. 287, he communicated "A natural and obvious Manner of constructing Sun-dials, deduced from the Situation and Motion of the Earth with respect to the Sun," explained by a scheme. And in that for 1778, p. 526, his remarks on colouring, suggested by way of a note on the "Epistle to an eminent Painter," will show that his talents were by no means impaired at the age of 86. Indeed he retained them to the last, and had even strength and spirits sufficient to enable him to ride out daily on horseback the summer before he died. A strong constitution, habitual temperance, and constant attention to his health in youth as well as in age, prolonged his life, and preserved his faculties to his 88th year, when he gradually ceased to breathe, and, as it were, fell asleep on March 3. 1780. He was interred in the south aisle of Canterbury cathedral, leaving one son, Anthony, educated in his own profession; and a daughter, Susanna, mentioned above.

His abilities as a painter appear in his works, which will not only be admired by his contemporaries, but by their posterity; as his tints, like those of Rubens and Vandyck, instead of being impaired, are improved by time, which some of them have now withstood above 60 years. His idea of beauty, when he indulged his fancy, was of the highest kind; and his knowledge of perspective gave him great advantages in family-pieces, of which he painted more than any one of his time. He could take a likeness by memory as well as by a sitting, as appears by his picture of the duke of Lorrain (the late emperor), which Faber engraved; and those of King George II. (in York-assembly-room); Queen Caroline, the two Miss Gunnings, &c. Like many other great painters, he had "a poet for his friend," in the late Mr Browne; to which may be added a poem addressed to him in 1726, by the reverend Mr Bunce, at that time of Trinity-hall, Cambridge, who succeeded Mr Highmore, and in 1780 was vicar of St Stephen's near Canterbury.

HIGHNESS, a quality or title of honour given to princes.—The kings of England and Spain had formerly no other title but that of *highness*; the first till the time of James I. and the second till that of Charles V. The petty princes of Italy began first to be complimented with the title of *highness* in the year 1630.—The duke of Orleans assumed the title of *royal highness* in the year 1631, to distinguish himself from the other princes of France.

The duke of Savoy, afterwards king of Sardinia, bore the title of *royal highness*, on account of his pretensions to the kingdom of Cyprus.—It is said that duke only took the title of *royal highness*, to put himself above the duke of Florence, who was called *great duke;* but the great duke afterwards assumed the title of *royal highness*, to put himself on a level with the duke of Savoy.

The prince of Conde first took the title of *most serene highness*, leaving that of simple *highness* to the natural princes.

HILARIA, in antiquity, feasts celebrated every year by the Romans on the 8th of the kalends of April, or the 25th of March, in honour of Cybele the mother of the gods.

The hilaria were solemnized with great pomp and rejoicing. Every person dressed himself as he pleased, and took the marks or badges of whatever dignity or quality he had a fancy for. The statue of the goddess was carried in procession through the streets of the city, accompanied by multitudes in the most splendid attire. The day before the festival was spent in tears and mourning. Cybele represented the earth, which at this time of the year begins to feel the kindly warmth of the spring; so that this sudden transition from sorrow to joy was an emblem of the vicissitude of the seasons, which succeed one another.

The Romans took this feast originally from the Greeks, who called it ανάβασις, q. d. *ascensus;* the eve of that day they spent in tears and lamentations, and thence denominated it κατάβασις, *descensus*.

Afterwards, the Greeks took the name ἱλαρια from the Romans; as appears from Photius, in his extract of the life of the philosopher Isidore.

Casaubon maintains, that beside this particular signification, the word hilaria was also a general name for any joyful or festival day, whether public or private and domestic. But Salmasius does not allow of this.

Tristan, tom. i. p. 482, distinguishes between hilaria and hilariæ. The former, according to him, were public rejoicings; and the latter, prayers made in consequence thereof; or even of any private feast or rejoicing, as a marriage, &c. The public lasted several days; during which, all mourning and funeral ceremonies were suspended.

HILARIUS, an ancient father of the Christian church, who flourished in the 4th century. He was born, as St Jerome informs us, at Poictiers, of a good family; who gave him a liberal education in the Pagan religion, and which he did not forsake till he was arrived at maturity. He was advanced to the bishopric of Poictiers in the year 355, according to Baronius: and became a most zealous champion for the orthodox faith, particularly against the Arians, who were at that time gaining ground in France. He assembled several councils there, in which the determinations of the synods of Rimini and Seleucia were condemned. He wrote a treatise concerning synods; and a famous work in 12 books on the Trinity, which is much admired by the orthodox believers. He died in the latter end of the year 367. His works have been many times published; but the last and best edition of them was given by the Benedictines at Paris in 1693.

HILARODI, in the ancient music and poetry, a sort of poets among the Greeks, who went about singing little gay poems or songs, somewhat graver than the Ionic pieces, accompanied with some instrument. From the streets they were at last introduced into tragedy,

tragedy, as the magodi were into comedy. They appeared dressed in white, and were crowned with gold. At first they wore shoes; but afterwards they assumed the crepida, being only a sole tied over with a strap.

HILARY-TERM. See TERM.

HILDESHEIM, a small district of Germany, in the circle of Lower Saxony. It lies between the duchies of Lunenburg and Brunswick; and may be about 25 miles from east to west, and 36 from north to south. It is watered by the rivers Leine and Innersty. The soil is fertile; and its principal places are Peine, Sarsted, Bruggen, and Alveld. Hildesheim, from whence it takes its name, is governed as an imperial city. Its bishop is now elector of Cologne.

HILDESHEIM, a strong city of Germany, in Lower Saxony, with a Roman Catholic bishop's see, whose bishop is sovereign. It is a free imperial city, though in some things dependent on the bishop. It is a large town, well built and fortified. It is divided into the Old Town and the New, which have each their separate council. It is seated on the river Irnest, in E. Long. 10. 0. N. Lat. 52. 17.

HILL, a term denoting any considerable eminence on the earth's surface. It is sometimes synonymous with the word *mountain*; though generally it denotes only the lesser eminences, the word *mountain* being particularly applied to the very largest. See MOUNTAIN, GEOLOGY *Index*.

HILL, *Aaron*, a poet of considerable eminence, the son of a gentleman of Malmesbury-abbey in Wiltshire, was born in 1685. His father's imprudence having cut off his paternal inheritance, he left Westminster school at 14 years of age; and embarked for Constantinople, to visit Lord Paget the English ambassador there, who was his distant relation. Lord Paget received him with surprise and pleasure, provided him a tutor, and sent him to travel: by which opportunity he saw Egypt, Palestine, and a great part of the east; and returning home with his noble patron, visited most of the courts of Europe. About the year 1709, he published his first poem entitled Camillus, in honour of the earl of Peterborough who had been general in Spain; and being the same year made master of Drury-lane theatre, he wrote his first tragedy Elfred, or the Fair Inconstant. In 1710, he became master of the opera-house in the Hay-market; when he wrote an opera called Rinaldo, which met with great success, being the first that Mr Handel set to music after he came to England. Unfortunately for Mr Hill, he was a projector as well as poet, and in 1715 obtained a patent for extracting oil from beech-nuts; which undertaking, whether good or bad, miscarried after engaging three years of his attention. He was also concerned in the first attempt to settle the colony of Georgia; from which he never reaped any advantage; and in 1728 he made a journey into the Highlands of Scotland, on a scheme of applying the woods there to ship-building; in which also he lost his labour. Mr Hill seems to have lived in perfect harmony with all the writers of his time, except Mr Pope, with whom he had a short paper-war, occasioned by that gentleman's introducing him in the Dunciad, as one of the competitors for the prize offered by the goddess of Dullness, in the following lines:

"Then *Hill* essay'd; scarce vanish'd out of sight,
"He buoys up instant, and returns to light;
"He bears no token of the sabler streams,
"And mounts far off among the Swans of Thames."

This, though far the gentlest piece of satire in the whole poem, and conveying at the same time an oblique compliment, roused Mr Hill to take some notice of it; which he did by a poem written during his peregrination in the north, entitled, "The Progress of Wit, a Caveat for the use of an eminent writer;" which he begins with the following eight lines, in which Mr Pope's too well-known disposition is elegantly, yet very severely, characterized:

"Tuneful *Alexis* on the Thames' fair side,
"The Ladies play-thing and the Muses pride;
"With merit popular, with wit polite,
"Easy tho' vain, and elegant tho' light;
"Desiring and deserving others praise,
"Poorly accepts a Fame he ne'er repays:
"Unborn to cherish, sneakingly approves:
"And wants the soul to spread the worth he loves."

The *sneakingly approves*, in the last couplet, Mr Pope was much affected by; and indeed through their whole controversy afterwards, in which it was generally thought that Mr Hill had much the advantage, Mr Pope seems rather to express his repentance by denying the offence, than to vindicate himself supposing it to have been given. Besides the above poems, Mr Hill, among many others, wrote one, called *The northern star*, upon the actions of Czar Peter the Great; for which he was several years afterwards complimented with a gold medal from the empress Catharine, according to the Czar's desire before his death. He likewise altered some of Shakespeare's plays, and translated some of Voltaire's. His last production was Merope; which was brought upon the stage in Drury-lane by Mr Garrick. He died on the 8th of February 1749, as it is said, in the very minute of the earthquake; and after his decease four volumes of his works in prose and verse were published in octavo, and his dramatic works in two volumes.

HILL, *Sir John*, a voluminous writer, was originally bred an apothecary; but his marrying early, and without a fortune, made him very soon look around for other resources than his profession. Having, therefore, in his apprenticeship, attended the botanical lectures of the company, and being possessed of quick natural parts, he soon made himself acquainted with the theoretical as well as practical parts of botany: from whence being recommended to the late duke of Richmond and Lord Petre, he was by them employed in the inspection and arrangement of their botanic gardens. Assisted by the liberality of these noblemen, he executed a scheme of travelling over the kingdom, to collect the most rare and uncommon plants; which he afterward published by subscription: but after great researches and uncommon industry, this undertaking turned out by no means adequate to his expectation. The stage next presented itself, as a soil in which genius might stand a chance of flourishing: but after two or three unsuccessful attempts, it was found he had no pretensions either to the sock or buskin: which once more reduced him to his botanical pursuits, and his

business

bufinefs as an apothecary. At length, about the year 1746, he tranflated from the Greek, a fmall tract written by Theophraftus, on Gems, which he publifhed by fubfcription; and which, being well executed, procured him friends, reputation, and money. Encouraged by this, he engaged in works of greater extent and importance. The firft he undertook was A General Natural Hiftory, in 3 vols folio. He next engaged, in conjunction with George Lewis Scott, Efq. in furnifhing a Supplement to Chambers's Dictionary. He at the fame time ftarted the Britifh Magazine; and while he was engaged in a great number of thefe and other works, fome of which feemed to claim the continued attention of a whole life, he carried on a daily effay, under the title of Infpector. Amidft this hurry of bufinefs, Mr Hill was fo laborious and ready in all his undertakings, and was withal fo exact an economift of his time, that he fcarcely ever miffed a public amufement for many years: where, while he relaxed from the feverer purfuits of ftudy, he gleaned up articles of information for his periodical works. It would not be eafy to trace Mr Hill, now Dr Hill (for he procured a diploma from the college of St Andrew's), through all his various purfuits in life. A quarrel he had with the Royal Society, for being refufed as a member, which provoked him to ridicule that learned body, in A Review of the Works of the Royal Society of London, 4to, 1751; together with his over-writing himfelf upon all fubjects without referve; made him fink in the eftimation of the public nearly in the fame pace as he had afcended. He found as ufual, however, refources in his own invention. He applied himfelf to the preparation of certain fimple medicines: fuch as the effence of water-dock, tincture of valerian, balfam of honey, &c. The well-known fimplicity of thefe medicines made the public judge favourably of their effects, infomuch that they had a rapid fale, and once more enabled the doctor to figure in that ftyle of life ever fo congenial to his inclination. Soon after the publication of the firft of thefe medicines, he obtained the patronage of the earl of Bute, through whofe intereft he acquired the management of the royal gardens at Kew, with an handfome falary: and to wind up the whole of an extraordinary life, having, a little before his death, feized an opportunity to introduce himfelf to the knowledge of the king of Sweden, that monarch invefted him with one of the orders of his court, which title he had not the happinefs of enjoying above two years. He died toward the clofe of the year 1775.

HILLEL, fenior, of Babylon, prefident of the fanhedrim of Jerufalem. He formed a celebrated fchool there, in which he maintained the oral traditions of the Jews againft Shamai, his colleague, whofe difciples adhered only to the written law; and this controverfy gave rife to the fects of Pharifees and Scribes. He was likewife one of the compilers of the Talmud. He alfo laboured much at giving a correct edition of the facred text; and there is attributed to him an ancient manufcript bible, which bears his name. He flourifhed about 30 years B. C. and died in a very advanced age.

HILLEL, the nafi, or prince, another learned Jew, the grandfon of Judas Hakkodefh, or the Saint, the author of the Mifhna, lived in the fourth century. He compofed a cycle; and was one of the principle doctors of the Gamara. The greateft number of the Jewifh writers attribute to him the correct edition of the Hebrew text which bears the name of *Hillel*, which we have already mentioned in the preceding article. There have been feveral other Jewifh writers of the fame name.

HILLIA, a genus of plants belonging to the hexandria clafs; and in the natural method ranking with thofe of which the order is doubtful. See BOTANY *Index*.

HILLSBOROUGH, a borough, fair, and poft-town, in the county of Down, and province of Ulfter, 69 miles from Dublin. Here is a fine feat of the earl of Hillfborough. The town is pleafantly fituated and almoft new built, in view of Lifburn, Belfaft, and Carrickfergus bay; the church is magnificent, having an elegant fpire, as lofty as that of St Patrick's in Dublin, and feven painted windows. Here is an excellent inn, and a thriving manufacture of muflins. It has three fairs, and fends two members to parliament. This place gives title of earl to the family of Hillfborough. N. Lat. 54. 30. W. Long. 60. 20.

HILUM, among botanifts, denotes the eye of a bean.

HIMERA, in *Ancient Geography*, the name of two rivers in Sicily; one running northwards into the Tufcan fea, now called *Fiume di Termini;* and the other fouthwards into the Libyan; dividing Sicily into two parts, being the boundary between the Syracufans to the eaft and Carthaginians to the weft; not rifing from the fame, but from different fprings.

HIMERA, in *Ancient Geography*, a town of Sicily, at the mouth of the Himera, which ran northwards, on its left or weft fide: A colony of Zancle: afterwards deftroyed by the Carthaginians (Diodorus Siculus).

HIMERENSES THERMÆ, in *Ancient Geography*, a town of Sicily, on the eaft fide of that Himera which runs to the north. After the deftruction of the town of Himera by the Carthaginians, fuch of the inhabitants as remained, fettled in the fame territory, not far from the ancient town. Now Termini. Made a Roman colony by Auguftus.

HIN, a Hebrew meafure of capacity for things liquid, containing the fixth part of an ephah, or one gallon two pints Englifh meafure.

HINCKLEY, a market-town of Leicefterfhire, built on a rifing ground, nearly on the borders of Leicefterfhire, from which it is feparated by the Roman Watling-ftreet road. It is diftant from Coventry and Leicefter 15 miles each, and 102 from London. It has been much larger than it is at prefent, the back lanes between the orchards having evidently been ftreets originally, and the traces of the town-wall and ditch are in many places yet vifible. There are veftiges of two Roman works, viz. the mount near the river, and the ruins of a bath near St Nicholas church, where teffelated pavements have been dug up. The Jewry wall is faid to have been the temple of Janus. The caftle was inhabited by John of Gaunt; but is now no more, the fcite being converted into garden-ground, the caftle-hill confiderably lowered, and a gentleman's houfe erected on the fpot in 1770. The fteeple of the prefent church was built with fome of the ftones of the caftle. The town is now divided into the borough, and

and the bond without the liberties. It has a good market on Mondays, and a fair in August. The chief manufacture is stockings and fine ale. The town is said to contain about 750 houses. There are two churches, one chapel, and a place of worship for the Roman Catholics, besides four meeting-houses. The church is a neat large old structure with a modern tower and a spire, the body of it was built in the 13th century, and near it are three mineral springs. This town is said to be the middle and highest ground in England; and from it 50 churches may be seen, besides gentlemen's seats. It received great damage by a fire September 5. 1728.

HIND, a female stag in the third year of its age. See CERVUS, MAMMALIA *Index*.

HINDON, a small town of Wiltshire in England, which sends two members to parliament. It is situated in E. Long. 2. 14. N. Lat. 51. 12.

HINDOOS, or GENTOOS, the inhabitants of that part of India known by the name of *Hindostan* or the *Mogul's empire*, who profess the religion of the Bramins, supposed to be the same with that of the ancient Gymnosophists of Ethiopia.

From the earliest period of history these people seem to have maintained the same religion, laws, and customs, which they do at this day: and indeed they and the Chinese are examples of perseverance in these respects altogether unknown in the western world. In the time of Diodorus Siculus they are said to have been divided into seven casts or tribes: but the intercourse betwixt Europe and India was in his time so small, that we may well suppose the historian to have been mistaken, and that the same tenacity for which they are so remarkable in other respects has manifested itself also in this. At present they are divided only into four tribes; 1. The Bramin; 2. The Khatry; 3. The Bhyse; and, 4. The Soodera. All these have distinct and separate offices, and cannot, according to their laws, intermingle with each other; but for certain offences they are subject to the loss of their cast, which is reckoned the highest punishment they can suffer; and hence is formed a kind of fifth cast named *Pariars* on the coast of Coromandel, but in the Shanscrit or sacred language *Chandalas*. These are esteemed the dregs of the people, and are never employed but in the meanest offices. There is besides a general division which pervades the four casts indiscriminately and which is taken from the worship of their gods *Vishnou* and *Sheevah;* the worshippers of the former being named *Vishnou-bukht;* of the latter *Sheevah-bukht*.

1 Their divisions into tribes or casts.

Of these four casts the Bramins are accounted the foremost in every respect; and all the laws have such an evident partiality towards them, as cannot but induce us to suppose that they have had the principal hand in framing them. They are not, however, allowed to assume the sovereignty; the religious ceremonies and the instruction of the people being their peculiar province. They alone are allowed to read the *Veda* or sacred books; the *Khatries*, or cast next in dignity, being only allowed to hear them read; while the other two can only read the *Sastras* or commentaries upon them. As for the poor Chandalas, they dare not enter a temple, or be present at any religious ceremony.

In point of precedency the Bramins claim a superiority even to the princes; the latter being chosen out of the Khatry or second cast. A rajah will receive with respect the food that is prepared by a Bramin, but the latter will eat nothing that has been prepared by any member of an inferior cast. The punishment of a Bramin for any crime is much milder than if he had belonged to another tribe; and the greatest crime that can be committed is the murder of a Bramin. No magistrate must *desire* the death of one of these sacred persons, or cut off one of his limbs. They must be readily admitted into the presence even of princes whenever they please: when passengers in a boat, they must be the first to enter and to go out; and the waterman must besides carry them for nothing; every one who meets them on the road being likewise obliged to give place to them.

All the priests are chosen from among this order, such as are not admitted to the sacerdotal function being employed as secretaries and accountants. These can never afterwards become priests, but continue to be greatly reverenced by the other casts.

The Khatry or second cast are those from among whom the sovereigns are chosen.—The Bhyse or Banians, who constitute the third cast, have the charge of commerical affairs; and the Soodera, or fourth cast, the most numerous of all, comprehend the labourers and artisans. These last are divided into as many classes as there are followers of different arts; all the children being invariably brought up to the profession of their fathers, and it being absolutely unlawful for them ever to alter it afterwards.

No Hindoo is allowed to quit the cast in which he was born upon any account. All of them are very scrupulous with regard to their diet; but the Bramins much more so than any of the rest. They eat no flesh, nor shed blood; which we are informed by Porphyry and Clemens Alexandrinus was the case in their time. Their ordinary food is rice and other vegetables, dressed with *ghee* (a kind of butter melted and refined so as to be capable of being kept for a long time), and seasoned with ginger and other spices. The food which they most esteem, however, is milk, as coming from the cow; an animal for which they have the most extravagant veneration, insomuch that it is enacted in the code of Gentoo laws, that any one who exacts labour from a bullock that is hungry or thirsty, or that shall oblige him to labour when fatigued or out of season, is liable to be fined by the magistrates. The other casts, though less rigid, abstain very religiously from what is forbidden them; nor will they eat any thing provided by a person of an inferior cast, or by one of a different religion. Though they may eat some kinds of flesh and fish, yet it is counted a virtue to abstain from them all. None of them are allowed to taste intoxicating liquor of any kind. Quintus Curtius indeed mentions a sort of wine made use of by the Indians in his time; but this is supposed to have been no other than toddy, or the unfermented juice of the cocoa nut. This when fermented affords a spirit of a very unwholesome quality; but it is drunk only by the Chandalas and the lower class of Europeans in the country. So exceedingly bigotted and superstitious are they in their absurd maxims with regard to meat and drink, that some seapoys in a British ship having expended

expended all the water appropriated to their uſe, would have ſuffered themſelves to periſh for thirſt rather than taſte a drop of that which was uſed by the ſhip's company.

2 Of the religion of the Hindoos.

The religion of the Hindoos, by which theſe maxims are inculcated, and by which they are made to differ ſo much from other nations, is contained in certain books named *Veda*, *Vedams*, or *Beds*, written in a language called *Shanſcrit*, which is now known only to the learned among them. The books are ſuppoſed to have been the work not of the ſupreme God himſelf, but of an inferior deity named *Brimha*. They inform us, that Brama, or Brahma, the ſupreme God, having created the world by the word of his mouth, formed a female deity named *Bawaney*, who in an enthuſiaſm of joy and praiſe brought forth three eggs. From theſe were produced three male deities, named *Brimha*, *Viſhnou*, and *Sheevah*. Brimha was endowed with the power of creating the things of this world, Viſhnou with that of cheriſhing them, and Sheevah with that of reſtraining and correcting them. Thus Brimha became the creator of man; and in this character he formed the four caſts from different parts of his own body, the Bramins from his mouth, the Khatry from his arms, the Banians from his belly and thighs, and the Soodera from his feet. Hence, ſay they, theſe four different caſts derive the different offices aſſigned them; the Bramins to teach; the Khatry to defend and govern; the Banians to enrich by commerce and agriculture; and the Soodera to labour, ſerve, and obey. Brama himſelf endowed mankind with paſſions, and underſtanding to regulate them; while Brimha, having created the inferior beings, proceeded to write the Vedams, and delivered them to be read and explained by the Bramins.

The religion of the Hindoos, though involved in ſuperſtition and idolatry, ſeems to be originally pure; inculcating the belief of an eternal and omnipotent Being; their ſubordinate deities Brimha, Viſhnou, and Sheevah, being only repreſentatives of the wiſdom, goodneſs, and power, of the ſupreme God Brama. All created things they ſuppoſe to be *types* of the attributes of Brama, whom they call the *principle of truth*, the *ſpirit of wiſdom*, and the *ſupreme being*; ſo that it is probable that all their idols were at firſt only deſigned to repreſent theſe attributes.

3 Different ſects.

There are a variety of ſects among the Hindoos: two great claſſes we have mentioned already, viz. the worſhippers of Viſhnou, and thoſe of Sheevah; and theſe diſtinguiſh themſelves, the former by painting their faces with an horizontal line, the latter by a perpendicular one. There is, however, very little difference in point of religion between theſe or any other Hindoo ſects. All of them believe in the immortality of the ſoul, a ſtate of future rewards and puniſhments, and tranſmigration. Charity and hoſpitality are inculcated in the ſtrongeſt manner, and exiſt among them not only in theory but in practice. "Hoſpitality (ſay they) is commanded to be exerciſed even towards an enemy, when he cometh into thine houſe; the tree doth not withdraw its ſhade even from the wood-cutter. Good men extend their charity even to the vileſt animals. The moon doth not withhold her light even from the Chandala." Theſe pure doctrines, however, are intermixed with ſome of the vileſt and moſt abſurd ſuperſtitions; and along with the true God they worſhip a number of inferior ones, of whom the principal are:

4 Account of their principal deities.

1. *Bawaney*, the mother of the gods, already mentioned, and ſuperior to all but Brama himſelf; but all the other goddeſſes are reckoned inferior to their gods or lords.

2. *Brimha*, in the Shanſcrit language ſaid to mean "the wiſdom of God;" and who is ſuppoſed to fly on the wings of the *hanſe* or flamingo; an image of which is conſtantly kept near that of the god in the temple where he is worſhipped. He has a crown on his head, and is repreſented with four hands. In one of theſe he holds a ſceptre, in another the ſacred books or Vedam, in the third a ring or circle as the emblem of eternity, ſuppoſed to be employed in aſſiſting and protecting his works.

3. *Seraſwatej*, the goddeſs or wife of Brimha, preſides over muſic, harmony, eloquence, and invention. She is alſo ſaid to be the inventreſs of the letters called *Devanagry*, by which the divine will was firſt promulgated among mankind. In the argument of an hymn addreſſed to this goddeſs, ſhe is ſuppoſed to have a number of inferior deities acting in ſubordination to her. Theſe are called *Rags*, and preſide over each mode, and likewiſe over each of the ſeaſons. Theſe ſeaſons in Hindoſtan are ſix in number; viz. 1. The *Seeſar*, or dewy ſeaſon. 2. *Heemat*, or the cold ſeaſon. 3. *Vaſant*, the mild ſeaſon or ſpring. 4. *Greſhma*, or the hot ſeaſon. 5. *Varſa*, the rainy ſeaſon. 6. *Sarat*, the breaking up or end of the rains.

The *Rags*, in their muſical capacity, are accompanied each with five *Ragnies*, a kind of female deities or nymphs of harmony. Each of theſe has eight ſons or genii; and a diſtinct ſeaſon is appointed for the muſic of each rag, during which only it can be ſung or played; and this at diſtinct or ſtated hours of the day or night. A ſeventh mode of muſic belonging to *Deipec*, or *Cupid the inflamer*, is ſaid once to have exiſted, but now to be loſt; and a muſician, who attempted to reſtore it, to have been conſumed with fire from heaven.

4. *Viſhnou*, the moſt celebrated of all the Indian deities, is ſuppoſed to fly or ride on the garoora, a kind of large brown kite, which is found in plenty in the neighbourhood; and on which Viſhnou is ſometimes repreſented as ſitting; though at others he is repreſented on a ſerpent with a great number of different heads. At ſome of his temples the Bramins accuſtom all the birds they can find, of the ſpecies above mentioned, to come and be fed; calling them by ſtriking upon a braſs plate. This deity is ſaid to have had ten different incarnations to deſtroy the giants with which the earth was infeſted; and in theſe he is repreſented in as many different figures, all of which are to the laſt degree fantaſtic and monſtrous. His common form is that of a man with four hands, and a number of heads ſet round in a circle, ſuppoſed to be emblems of omniſcience and omnipotence. In his firſt incarnation he is repreſented as coming out of the mouth of a fiſh, with ſeveral hands containing ſwords, &c. In another he has the head of a boar with monſtrous tuſks, bearing a city in the air, and ſtands upon a vanquiſhed giant with horns on his head. In others of his incarnations, he has the head of a horſe or other animals,

animals, with a great number of arms brandishing swords, &c.

In some parts of his character this deity is represented not as a destroyer, but a preserver of mankind; and he is then distinguished by the name of *Hary*. Bishop Wilkins describes an image of him in this character at a place named *Jehan-query*, a small rocky island of the Ganges in the province of Bahar. This image is of a gigantic size, recumbent on a coiled serpent, whose numerous heads are twisted by the artist into a kind of canopy over the sleeping god, and from each of its mouths issues a forked tongue, as threatening destruction to those who should dare to approach.

5. *Sheevah* is represented under a human form, though frequently varied, as is also his name; but he is most frequently called *Sheevah* and *Mahadeg*. In his destroying character he is represented as a man with a fierce look, and with a snake twisted round his neck. He is thought to preside over good and evil fortune, in token of which he is represented with a crescent on his head. He rides upon an ox.

6. *Vikrama*, the god of victory, is said to have had a particular kind of sacrifice offered to him, somewhat like the scape-goat of the Jews, viz. by letting a horse loose in the forest, and not employing him again.

7. *Yam Rajah*, or *Darham Rajah*, is represented as the judge of the dead, and ruler of the infernal regions, in a manner similar to the Minos and Pluto of the ancient Greeks. He is the son of *Sour*, "the sun," by *Bisookama* daughter of the great architect of the heavenly mansions, and patron of artificers. He rides upon a buffalo, with a sceptre in his hand, having two assistants, *Chiter* and *Gopt;* the former of whom reports the good, and the latter the bad actions of men. These are attended by two genii, who watch every individual of the human race; Chiter's spy being on the right, and Gopt's on the left. The souls of deceased persons are carried by the *Jambouts* or messengers of death into the presence of *Darham*, where their actions are instantly proclaimed, and sentence passed accordingly. The infernal mansions are named by the Hindoos *Narekha*, and are divided into a great number of places, according to the degrees of punishment to be endured by the criminal; but eternal punishment for any offence is supposed to be inconsistent with the goodness of God. Instead of this, the Hindoos suppose, that after the souls of the wicked have been punished long enough in Narekha, they are sent back into the world to animate other bodies either of men or beasts, according to circumstances. Those who have lived a life partly good and partly bad, are likewise sent back to this world; and these trials and transmigrations are repeated till they be thoroughly purged of all inclination to sin. But as for those holy men who have spent their lives in piety and devotion, they are instantly conveyed by the genii to the mansions of celestial bliss, where they are absorbed into the universal spirit; a state, according to every idea we can form, equivalent to annihilation!

8. *Krishen* and the nine *Gopia*, among the Hindoos, correspond with Apollo and the nine muses of the Greeks. This deity is represented as a young man sometimes playing on a flute. He has a variety of names, and is supposed to be of a very amorous complexion, having once resided in a district named *Birge*, where he embraced almost all the women in the country. From his residence here, or from these amorous exploits, he is sometimes called *Birge-put*.

9. *Kamæ-deva*, the god of love, is said to be the son of *Maya*, or the general attractive power; married to *Retty*, or *Affection*. He is represented as a beautiful youth, sometimes conversing with his mother or consort in his temples or gardens; at other times riding on a parrot by moonlight: And Mr Forster informs us, that on the taking of Tanjore by the English, a curious picture was found, representing him riding on an elephant, the body of which was composed of seven young women twisted together in such a manner as to represent that enormous animal. This is supposed to be a device of a similar nature with that of the Greeks, who placed their *Eros* upon a lion; thus intimating, that love is capable of taming the fiercest of animals. The bow of this deity is said to be of sugar-cane, or of *flowers*, and the string of *bees:* he has five arrows, each of them tipped with an Indian blossom of an heating nature. His ensign is a fish on a red ground, carried by the foremost of his attendant nymphs or dancing girls.

10. *Lingam*, corresponding to the Priapus or Phallus of the ancients, is worshipped by the Hindoos in order to obtain fecundity. This deity is adorned the more fervently, as they depend on their children for performing certain ceremonies to their manes, which they imagine will mitigate their punishment in the next world. The devotees of the god go naked, but are supposed to be such sanctified persons, that women may approach them without any danger. They vow perpetual chastity; and death is the consequence of a breach of their vow. Husbands whose wives are barren invite them to their houses, where certain ceremonies, generally thought to be effectual, are performed.

Besides these, there is a number of other gods whose character is less eminent; though it seems not to be ascertained distinctly, even by the Hindoos themselves, what particular rank each deity holds with respect to another. Some of these deities are, 11. *Nared*, the son of Brimha, and inventor of a fretted instrument named *Vene*. 12. *Lechmy*, the goddess of plenty, and wife of Vishnou. 13. *Gowry*, *Kaly*, from *Kala* "time;" the wife of Sheevah, and goddess of destruction. 14. *Varoona*, the god of the seas and waters, riding on a crocodile. 15. *Vayoo*, the god of the winds, riding on an antelope with a sabre in his hand. 16. *Agnee*, the god of fire, riding on a ram. 17. *Vasoodka*, a goddess representing the earth. 18. *Pakreety*, or nature, represented by a beautiful young woman. 19. *Sour* or *Shan*, the sun; called also the king of the stars and planets, represented as sitting in a chariot drawn by one horse, sometimes with seven and sometimes with twelve heads. 20. *Sangia*, the mother of the river Jumna, and wife of the sun. 21. *Chandava*, the moon, in a chariot drawn by antelopes, and holding a rabbit in her right hand. 22. *Vreekaspaty*, the god of learning, attended by beautiful young nymphs, named *Veedyadhares*, or professors of science. 23. *Ganes*, the god of prudence and policy, worshipped before the undertaking of any thing of consequence. 24. *Fame*, represented by a serpent with a great number of tongues; and known by several names.

names. 25. *Darma-deva*, the god of virtue, ſometimes repreſented by a white bull. 26. *Virſavana* or *Cobhair*, the god of riches, repreſented by a man riding on a white horſe. 27. *Dhan-wantary*, the god of medicine.

5 Their demigods.

Beſides theſe ſupreme deities, the Hindoos have a number of demigods, who are ſuppoſed to inhabit the air, the earth, and the waters, and in ſhort the whole world; ſo that every mountain, river, wood, town, village, &c. has one of theſe tutelar deities, as was the caſe among the weſtern heathens. By nature theſe demigods are ſubject to death, but are ſuppoſed to obtain immortality by the uſe of a certain drink named *Amrut.* Their exploits in many inſtances reſemble thoſe of Bacchus, Hercules, Theſeus, &c. and in a beautiful epic poem named *Rancyan*, we have an account of the wars of Ram, one of the demigods, with Ravana tyrant of Ceylon.

6 Manner of worſhip.

All theſe deities are worſhipped, as in other countries, by going to their temples, faſting, prayers, and the performance of ceremonies to their honour. They pray thrice a day, at morning, noon, and evening, turning their faces towards the eaſt. They uſe many ablutions, and, like the Phariſees of old, they always waſh before meals. Running water is always preferred for this purpoſe to ſuch as ſtagnates. Fruits, flowers, incenſe, and money, are offered in ſacrifice to their idols; but for the dead they offer a kind of cake named *Peenda;* and offerings of this kind always take place on the day of the full moon. Nothing ſanguinary is known in the worſhip of the Hindoos at preſent, though there is a tradition that it was formerly of this kind; nay, that even human ſacrifices were made uſe of: but if ſuch a cuſtom ever did exiſt, it muſt have been at a very diſtant period. Their ſacred writings indeed make mention of bloody ſacrifices of various kinds, not excepting even thoſe of the human race: but ſo many peculiarities are mentioned with regard to the proper victims, that it is almoſt impoſſible to find them. The only inſtance of bloody ſacrifices we find on record among the Hindoos is that of the buffalo to Bawaney, the mother of the gods.

Among the Hindoos there are two kinds of worſhip, diſtinguiſhed by the name of the worſhip of the *inviſible God* and of *idols*. The worſhippers of the inviſible God are, ſtrictly ſpeaking, deiſts: the idolaters perform many abſurd and unmeaning ceremonies, too tedious to mention, all of which are conducted by a bramin; and during the performance of theſe rites, the dancing women occaſionally perform in the court, ſinging the praiſes of the deity in concert with various inſtruments. All the Hindoos ſeem to worſhip the fire; at leaſt they certainly pay a great veneration to it. Biſhop Wilkins informs us, that they are enjoined to light up a fire at certain times, which muſt be produced by the friction of two pieces of wood of a particular kind; and the fire thus produced is made uſe of for conſuming their ſacrifices, burning the dead, and in the ceremonies of marriage.

7 Their devotees.

Great numbers of devotees are to be met with every where through Hindoſtan. Every caſt is allowed to aſſume this way of life excepting the Chandalahs, who are excluded. Thoſe held moſt in eſteem are named *Seniaſſes* and *Jogeys*. The former are allowed no other clothing but what ſuffices for covering their nakedneſs, nor have they any worldly goods beſides a pitcher and ſtaff; but though they are ſtrictly enjoined to meditate on the truths contained in the ſacred writings, they are expreſsly forbidden to argue about them. They muſt eat but once a day, and that very ſparingly, of rice or other vegetables; they muſt alſo ſhow the moſt perfect indifference about hunger, thirſt, heat, cold, or any thing whatever relative to this world; looking forward with continual deſire to the ſeparation of the ſoul from the body. Should any of them fail in this extravagant ſelf-denial, he is rendered ſo much more criminal by the attempt, as he neglected the duties of ordinary life for thoſe of another which he was not able to accompliſh. The Jogeys are bound to much the ſame rules, and both ſubject themſelves to the moſt extravagant penances. Some will keep their arms conſtantly ſtretched over their heads till they become quite withered and incapable of motion; others keep them croſſed over their breaſt during life; while others, by keeping their hands conſtantly ſhut, have them quite pierced through by the growth of their nails. Some chain themſelves to trees or particular ſpots of ground, which they never quit; others reſolve never to lie down, but ſleep leaning againſt a tree: but the moſt curious penance perhaps on record is that of a Jogey, who meaſured the diſtance between Benares and Jaggernaut with the length of his body, lying down and riſing alternately. Many of theſe enthuſiaſts will throw themſelves in the way of the chariots of Viſhnou or Sheevah, which are ſometimes brought forth in proceſſion to celebrate the feaſt of a temple, and drawn by ſeveral hundreds of men. Thus the wretched devotees are in an inſtant cruſhed to pieces. Others devote themſelves to the flames, in order to ſhow their regard to ſome of their idols, or to appeaſe the wrath of one whom they ſuppoſe to be offended.

A certain ſet of devotees are named *Pandarams;* and another on the coaſt of Coromandel are named *Cary-Patra Pandarams*. The former rub themſelves all over with cow-dung, running about the country ſinging the praiſes of the god Sheevah whom they worſhip. The latter go about aſking charity at doors by ſtriking their hands together, for they never ſpeak. They accept of nothing but rice; and when they have got as much as will ſatisfy their hunger, never give themſelves any trouble about more, but paſs the reſt of the day in the ſhade, in a ſtate of ſuch ſupine indolence as ſcarcely to look at any object whatever. The Tadinums are another ſet of mendicants, who ſing the incarnations of Viſhnou. They have hollow braſs rings round their ancles, which they fill with pebbles; ſo that they make a conſiderable noiſe as they walk; they beat likewiſe a kind of tabor.

8 Mildneſs of the Hindoo religion.

The greateſt ſingularity in the Hindoo religion however, is, that ſo far from perſecuting thoſe of a contrary perſuaſion, which is too often the caſe with other profeſſors, they abſolutely refuſe even to admit of a proſelyte. They believe all religions to be equally acceptable to the Supreme Being; aſſigning as a reaſon, that if the Author of the univerſe preferred one to another, it would have been impoſſible for any other to have prevailed than that which he approved. Every religion, Hindoos. religion, therefore, they conclude to be adapted to the country where it is eſtabliſhed; and that all in their original purity are equally acceptable.

9 Their marriages. Among the Hindoos, marriage is conſidered as a religious duty; and parents are ſtrictly commanded to marry their children by the time they arrive at eleven years of age at fartheſt. Polygamy is allowed; but this licence is ſeldom made uſe of unleſs there ſhould be no children by the firſt wife. In caſe the ſecond wife alſo proves barren, they commonly adopt a ſon from among their relations.

The Hindoos receive no dower with their wives; but, on the contrary, the intended huſband makes a preſent to the father of his bride. Nevertheleſs, in many caſes, a rich man will chooſe a poor relation for his daughter; in which caſe the bride's father is at the expence of the wedding, receives his ſon-in-law into his houſe, or gives him a part of his fortune. The bridegroom then quits the dwelling of his parents with certain ceremonies, and lives with his father-in-law. Many formalities take place between the parties even after the match is fully agreed upon; and the celebration of the marriage is attended with much expence; magnificent proceſſions are made, the bride and bridegroom ſitting in the ſame palankeen, attended by their friends and relations; ſome riding in palankeens, ſome on horſes, and others on elephants. So great is their vanity indeed on this occaſion, that they will borrow or hire numbers of theſe expenſive animals to do honour to the ceremony. The rejoicings laſt ſeveral days; during the evenings of which, fire-works and illuminations are diſplayed, and dancing-women perform their feats; the whole concluding with alms to the poor, and preſents to the bramins and principal gueſts, generally conſiſting of ſhawls, pieces of muſlin, and other cloths. A number of other ceremonies are performed when the parties come of age, and are allowed to cohabit together. The ſame are repeated when the young wife becomes pregnant; when ſhe paſſes the ſeventh month without any accident; and when ſhe is delivered of her child. The relations aſſemble on the tenth day after the birth, to aſſiſt at the ceremony of naming the child; but if the bramins be of opinion that the aſpect of the planets is at that time unfavourable, the ceremony is delayed, and prayers offered up to avert the misfortune. When the lucky moment is diſcovered, they fill as many pots with water as there are planets, and offer a ſacrifice to them; afterwards they ſprinkle the head of the child with water, and the bramin gives it ſuch a name as he thinks beſt adapted to the time and circumſtances; and the ceremony concludes with prayers, preſents to the bramins, and alms to the poor. Mothers are obliged to ſuckle their own children; nor can this duty be diſpenſed with except in caſe of ſickneſs. New ceremonies, with preſents to the bramins, take place, when a boy comes of age to receive the ſtring which the three firſt caſts wear round their waiſt.

10 Education of children. Boys are taught to read and write by the bramins, who keep ſchools for that purpoſe throughout the country. They uſe leaves inſtead of books, and write with a pointed iron inſtrument. The leaves are generally choſen of the palm-tree, which being ſmooth and hard, and having a thick ſubſtance, may be kept for almoſt any length of time, and the letters are not ſubject to grow faint or be effaced. The leaves are cut into ſlips about an inch broad, and their books conſiſt of a number of theſe tied together by means of a hole in one end. Sometimes the letters are rubbed over with a black powder, to render them more legible. When they write upon paper, they make uſe of a ſmall reed. Sometimes they are initiated in writing by making letters upon ſand ſtrewed on the floor; and they are taught arithmetic by means of a number of ſmall pebbles. The education of the girls is much more limited; ſeldom extending farther than the articles of their religion.

Among theſe people the cuſtom of burning the dead prevails univerſally; and the horrid practice of wives burning themſelves along with their deceaſed huſbands was formerly very common, though now much leſs ſo. At preſent it is totally prohibited in the Britiſh dominions; and even the Mohammedans endeavour to diſcountenance a practice ſo barbarous, though many of their governors are accuſed of conniving at it through motives of avarice. At preſent it is moſt common in the country of the Rajahs, and among women of high rank. 11 Barbarous cuſtom of women burning themſelves.

This piece of barbarity is not enjoined by any law exiſting among the Hindoos; it is only ſaid to be *proper*, and rewards are promiſed in the next world to thoſe who do ſo. But though a wife chooſes to outlive her huſband, ſhe is in no caſe whatever permitted to marry again, even though the marriage with the former had never been completed. It is unlawful for a woman to burn herſelf if ſhe be with child at the time of her huſband's deceaſe, or if he died at a diſtance from her. In the latter caſe, however, ſhe may do ſo if ſhe can procure his girdle or turban to be put on the funeral pile along with her. Theſe miſerable enthuſiaſts, who devote themſelves to this dreadful death, ſuffer with the greateſt conſtancy; and Mr Holwel gives an account of one who, being told of the pain ſhe muſt ſuffer (with a view to diſſuade her), put her finger into the fire and kept it there for a conſiderable time; after which ſhe put fire on the palm of her hand, with incenſe upon it, and fumigated the bramins who were preſent. Sometimes a chapel is erected on the place where one of thoſe ſacrifices has been performed; ſometimes it is incloſed, flowers planted upon it, and images ſet up.—In ſome few places the Hindoos bury their dead; and ſome women have been known to ſuffer themſelves to be buried alive with their deceaſed huſbands: but the inſtances of this are ſtill more rare than thoſe of burning.—No woman is allowed any inheritance among the Hindoos; ſo that if a man dies without male iſſue, his eſtate goes to his adopted ſon or to his neareſt relation.

The Hindoos, though naturally mild and timid, will on many occaſions meet death with the moſt heroic intrepidity. An Hindoo who lies at the point of death, will talk of his deceaſe with the utmoſt compoſure; and if near the river Ganges, will deſire to be carried out, that he may expire on its banks. Such is the exceſſive veneration they have for their religion and cuſtoms, that no perſon will infringe them even to preſerve his own life. An Hindoo, we are told, being ill of a putrid fever, was prevailed upon to ſend for an European phyſician, who preſcribed him the bark in wine; but this was refuſed with the greateſt obſtinacy even to 12 Inſtances of heroiſm among the Hindoos.

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to the very last, though the governor himself joined in his solicitations, and in other matters had a considerable influence over him. In many instances these people, both in ancient and modern times, have been known, when closely besieged by an enemy whom they could not resist, to kill their wives and children, set fire to their houses, and then violently rush upon their adversaries till every one was destroyed. Some Seapoys, in the British service, having been concerned in a mutiny, were condemned to be blown away from the mouths of cannon. Of these some were grenadiers, who cried out, that as they had all along had the post of honour, they saw no reason why they should be denied it now; and therefore desired that they might be blown away first. This being granted, they walked forward to the guns with composure, begged that they might be spared the indignity of being tied, and, placing their breasts close to the muzzles, were shot away. The commanding officer was so much affected with this instance of heroism, that he pardoned all the rest.

13 Their general character.

In ordinary life the Hindoos are cheerful and lively; fond of conversation and amusements, particularly dancing. They do not, however, learn or practise dancing themselves, but have women taught for the purpose; and in beholding these they will spend whole nights. They disapprove of many parts of the education of European ladies, as supposing that they engage the attention too much, and draw away a woman's affection from her husband and children. Hence there are few women in Hindostan who can either read or write. In general they are finely shaped, gentle in their manners, and have soft and even musical voices. The women of Kashmere, according to Mr Forster, have a bright olive complexion, fine features, and delicate shape; a pleasing freedom in their manners, without any tendency to immodesty.

14 Dress of the women.

The dress of the modest women in Hindostan consists of a close jacket, which covers their breasts, but perfectly shows their form. The sleeves are tight, and reach half way to the elbows, with a narrow border painted or embroidered all round the edges. Instead of a petticoat, they have a piece of white cotton cloth wrapped round the loins, and reaching near the ancle on the one side, but not quite so low on the other. A wide piece of muslin is thrown over the right shoulder; which, passing under the left arm, is crossed round the middle, and hangs down to the feet. The hair is usually rolled up into a knot or bunch towards the back part of the head; and some have curls hanging before and behind the ears. They wear bracelets on their arms, rings in their ears, and on their fingers, toes, and ancles; with sometimes a small one in their nostril.

The dress of the dancing women, who are likewise votaries of Venus, is very various. Sometimes they wear a jama, or long robe of wrought muslin, or gold and silver tissue; the hair plaited and hanging down behind, with spiral curls on each side of the face. They are taught every accomplishment which can be supposed to captivate the other sex; form a class entirely different from the rest of the people, and live by their own rules. Their clothes, jewels, and lodging, are considered as implements of their trade, and must be allowed them in cases of confiscation for debt: They may drink spirituous liquors, and eat any kind of meat except beef: Their dances are said to resemble pretty exactly those of the ancient Bacchanalians represented in some of the ancient paintings and bas reliefs. In some of their dances they attach gold and silver bells to the rings of the same metals they wear on their ancles.

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15 Dress of the men.

The men generally shave their heads and beards, leaving only a pair of small whiskers and a lock on the back part of their head, which they take great care to preserve. In Kashmere and some other places, they let their beards grow to the length of two inches. They wear turbans on their heads; but the Bramins who officiate in the temples commonly go with their heads uncovered, and the upper part of the body naked: round their shoulder they hang the sacred string called *Zennar*, made of a kind of perennial cotton, and composed of a certain number of threads of a determined length. The Khatries wear also a string of this kind, but composed of fewer threads; the Bhyse have one with still fewer threads, but the Sooderas are not allowed to wear any string. The other dress of the Bramins consists of a piece of white cotton cloth wrapped about the loins, descending below the knee, but lower on the left than on the right side. In cold weather they sometimes put a red cap on their heads, and wrap a shawl round their bodies.—The Khatries, and most other of the inhabitants of this country, wear also pieces of cotton cloth wrapped round them, but which cover the upper as well as the lower part of the body. Ear-rings and bracelets are worn by the men as well as women: and they are fond of ornamenting themselves with diamonds, rubies, and other precious stones, when they can procure them. They wear slippers on their feet of fine woollen cloth or velvet, frequently embroidered with gold and silver; those of princes being sometimes adorned with precious stones. The lower classes wear sandals or slippers of coarse woollen cloth or leather. These slippers are always put off on going into any apartment, being left at the door, or given to an attendant; nevertheless the Hindoos make no complaints of the Europeans for not putting off their shoes when they come into their houses, which must certainly appear very uncouth to them.

Hindoo families are always governed by the eldest male, to whom great respect is shewn. Filial veneration is carried to such an height among them, that a son will not sit down in the presence of his father until ordered to do so: and Mr Forster observes, that during the whole time of his residence in India, he never saw a direct instance of undutifulness to parents; and the same is related by other writers.

16 Their houses.

The houses of the Hindoos make a worse appearance than could be supposed from their ingenuity in other respects. In the southern parts of the country, the houses are only of one story. On each side of the door, towards the street, is a narrow gallery covered by the slope of the roof which projects over it, and which, as far as the gallery extends, is supported by pillars of brick or wood. The floor of this gallery is raised about 20 inches above the level of the street, and the porters, or bearers of palankeens, with the foot soldiers named *Peons*, who commonly hire themselves to noblemen, often lie down in this place. This entrance leads into a court, which is also surrounded by a gallery like the former. On one side of the court is a large room, on a level with the floor of the gallery; open in front, and spread

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17 Learning of the Bramins.

The Bramins of India were anciently much celebrated for their learning, though they now make a very inconſiderable figure in compariſon with the Europeans. According to Philoſtratus, the Gymnoſophiſts of Ethiopia were a colony of Bramins, who, being obliged to leave India on account of the murder of their king near the banks of the Ganges, migrated into that country. The ancient Bramins, however, may juſtly be ſuppoſed to have cultivated ſcience with much greater ſucceſs than their deſcendants can boaſt of, conſidering the ruinous wars and revolutions to which the country has been ſubjected. Metaphyſics, as well as moral and natural philoſophy, appear to have been well underſtood among them; but at preſent all the Hindoo knowledge is confined to thoſe whom they call *Pundits*, "doctors or learned men." Theſe only underſtand the language called *Shanſcrit* or *Sanſcrit*, (from two words ſignifying perfection); in which the ancient books were written.

18 Metaphyſics.

The metaphyſics of the Bramins is much the ſame with that of ſome ancient Greek philoſophers. They believe the human ſoul to be an emanation from the Deity, as light and heat from the ſun. Gowtama, an ancient metaphyſician, diſtinguiſhes two kinds of ſouls, the divine and vital. The former reſembles the eternal ſpirit from which it came, is immaterial, indiviſible, and without paſſions; the vital ſoul is a ſubtile element which pervades all things, diſtinct from organiſed matter, and which is the origin of all our deſires. The external ſenſes, according to this author, are repreſentations of external things to the mind, by which it is furniſhed with materials for its various operations; but unleſs the mind act in conjunction with the ſenſes, the operation is loſt, as in that abſence of mind which takes place in deep contemplation. He treats likewiſe of reaſon, memory, perception, and other abſtract ſubjects. He is of opinion, that the world could not exiſt without a firſt cauſe; chance being nothing but the effect of an unknown cauſe: he is of opinion, however, that it is folly to make any conjectures concerning the beginning or duration of the world. In treating of providence, he denies any immediate interpoſition of the Deity; maintaining, that the Supreme Being having created the ſyſtem of nature, allowed it to proceed according to the laws originally impreſſed upon it, and man to follow the impulſe of his own deſires, reſtrained and conducted by his reaſon. His doctrine concerning a future ſtate is not different from what we have already ſtated as the belief of the Hindoos in general. According to Biſhop Wilkins, many of them believe that this world is a ſtate of rewards and puniſhments as well as of probation; and that good or bad fortune are the effects of good or evil actions committed in a former ſtate.

19 Their aſtronomy.

The ſcience for which the Bramins, however, were moſt remarkable, is that of aſtronomy; and in this their progreſs was ſo great, as even yet to furniſh matter of admiration to the moderns.—The Europeans firſt became acquainted with the Indian aſtronomy in 1687, from a Siameſe MS. containing rules for calculating the places of the ſun and moon, brought home by M. Loubere the French ambaſſador at Siam. The principles on which the tables in this MS. were founded, however, proved to be ſo obſcure, that it required the genius of Caſſini to inveſtigate them. The miſſionaries afterwards ſent over two other ſets of tables from Hindoſtan; but no attention was paid to them till M. le Gentil returned from obſerving the tranſit of Venus in 1769. During the time of his ſtay in Hindoſtan, the Bramins had been much more familiar with him on account of his aſtronomical knowledge, than they uſually were with Europeans; and he thus had an opportunity of obtaining conſiderable inſight into their methods of calculation. In conſequence of this inſtruction he publiſhed tables and rules, according to the Indian method, in the academy of ſciences for 1772; and in the explanation of theſe M. Bailly has employed a whole volume. The objects of this aſtronomy, according to Mr Playfair, are, 1. Tables and rules for calculating the places of the ſun and moon. 2. Of the planets. 3. For determining the phaſes of eclipſes. They divide the zodiac into 27 conſtellations, probably from the motion of the moon through it in 27 days; and to this lunar motion the Profeſſor aſcribes the general diviſion of time into weeks, which has prevailed ſo univerſally throughout the world. The days of the week were dedicated to the planets, as by the ancient heathens of the weſt, and in preciſely the ſame order. The ecliptic is divided into ſigns, degrees, and minutes, as with us: and indeed their calculations are entirely ſexageſimal, the day and night being divided into 60 hours; ſo that each of their hours is only 24 of our minutes, and each of their minutes 24 of our ſeconds. *Edin. Phil. Tranſ.*

The requiſites for calculating by the Indian tables are, 1. An obſervation of the celeſtial body in ſome paſt moment of time, which is commonly called the Epoch of the tables. 2. The mean rate of the planet's motion. 3. The correction on account of the irregular motion of the body, to be added or ſubtracted from the mean place, according to circumſtances. They calculate the places of the ſun and moon, not from the time of their entrance into Aries, but into the moveable Zodiac. Thus the beginning of the year is continually advancing with regard to the ſeaſons; and in 24,000 years will have made the complete round. The mean place of the ſun for any time is deduced on the ſuppoſition that 800 years contain 292,207 days; from whence, by various calculations, the length of the year comes out only 1′ 53″ greater than that of De la Caille; which is more accurate than any of our ancient aſtronomical tables. In the equation of the ſun's centre, however, they commit an error of no leſs than 16′: But Mr Playfair is of opinion that this cannot be aſcribed wholly to their inaccuracy, as there was a time when their calculation approached very near the truth; and even at preſent the error is leſs than it appears to be.

The motions of the moon are deduced from a cycle of 19 years; during which ſhe makes nearly 235 revolutions; and which period conſtitutes the famous cycle ſuppoſed to have been invented by Meton the Athenian aſtronomer, and from him called the Metonic Cycle. They are likewiſe ſurpriſingly exact in calculating

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ting the moon's apogee and fome of the inequalities of her motion; they know the apparent motion of the fixed ftars eaftward, and the Siamefe tables make it only four feconds too quick; which ftill fhows a great accuracy of calculation, as Ptolemy the celebrated aftronomer made an error of no lefs than 14 feconds in calculating the fame thing. M. Caffini, however, informs us, that thefe tables are not calculated for the meridian of Siam, but for a place 18° 15′ to the weftward of it, which brings us very near the meridian of Benares, the ancient feat of Indian learning. This likewife agrees with what the Hindoos call their firft meridian, which paffes through Ceylon, and the banks of the river Remananur. It muft be obferved, however, that the geography of the Hindoos is much more inaccurate than their aftronomy.

The date of the Siamefe tables is not very ancient; and that of the table above mentioned fent from Hindoftan by the miffionaries is ftill more modern. Thefe, however, are written in fuch an enigmatical manner, that the miffionary who fent them was unable to tell their meaning; and Mr Playfair fuppofes that even the Bramins themfelves were ignorant of it. Neverthelefs they were deciphered by M. le Gentil; who thinks that they have the appearance of being copied from infcriptions on ftone. The minutes and feconds are not ranged in vertical columns, but in rows under one another, and without any title to point out their meaning or connexion.

The tables of Trivalore are among the moft remarkable of all we are yet acquainted with. Their date, according to Mr Playfair, correfponds with the year 3102 B. C. thus running up to the year of the world 902, when Adam was ftill in life. This era is famous in Hindoftan, under the name of *Calyougham*: and as this extraordinary antiquity cannot but create fome fufpicion, Mr Playfair has been at fome pains to determine whether it is real or fictitious, i. e. whether it has been determined by actual obfervation, or derived by calculation from tables of more modern date. The refult of his labours is, that we are to account the Calyougham as determined by obfervation; and that had it been otherwife, we muft have been furnifhed with infallible methods of detecting the fallacy. His reafons for this opinion are,

1. The tafk would have been too difficult, even for modern aftronomers, to make the neceffary calculations without taking into account the difturbances arifing from the action of the heavenly bodies upon one another, and with which we cannot fuppofe the ancient aftronomers to have been equally well acquainted with the moderns. By reafon of thefe variations, as well as from the fmall errors unavoidable in every calculation, any fet of aftronomical tables will be found prodigioufly inaccurate when applied to any period very far diftant from the time of obfervation. Hence, fays our author, "it may be eftablifhed as a maxim, that if there be given a fyftem of aftronomical tables, founded on obfervations of an unknown date, that date may be found by taking the time when the tables reprefent the celeftial motions moft exactly." This indeed might be done, provided we were furnifhed with any fet of perfectly accurate tables with which we could compare the fufpected ones; and Mr Playfair thinks it "a very reafonable poftulatum," that our modern aftronomical tables, though not perfectly accurate, are yet capable of determining the places of the celeftial bodies without any fenfible error for a longer period than that of the Calyougham.

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2. By calculation from our modern tables, it appears that the place of the ftar Aldebaran, at the commencement of the Calyougham, differs only 53′ from what the Indian tables make it. He thinks this coincidence the more remarkable, as the Bramins, by reafon of the inaccuracy of their own date, would have erred by four or five degrees, had they calculated from their moft modern tables dated in 1491.

3. At the commencement of this epoch (which according to M. Bailly, happened at midnight between the 17th and 18th of February 3102 B. C. the fun was in $10^s\ 3°\ 38'\ 13''$ by the Indian tables. But the mean longitude of the fun, according to the tables of M. de la Caille, for the fame time, comes out to be only $10^s\ 1°\ 5'\ 57''$, fuppofing the preceffion of the equinoxes to have been the fame at that time as now. M. de la Grange, however, has demonftrated, that, in former ages, the preceffion of the equinoxes was lefs than at prefent; whence there arifes an equation of 1° 45′ 22″ to be added to the fun's place already mentioned; and thus it will differ only 47 from the radical place in the tables of Trivalore. Notwithftanding this reafoning, however, Mr Playfair thinks that no ftrefs is to be laid upon this argument, as it depends on the truth of a conjecture of M. Bailly that the place of the fun above mentioned was not the mean but the true one.

4. The mean place of the moon at Benares, calculated from Mr Mayer's tables, for the 18th of February 3102 B. C. will be $10^s\ 0°\ 51'\ 16''$, provided her motion had all that time been equable: but the fame aftronomer informs us, that the motion of the moon is fubject to a fmall but uniform acceleration, about 9″ in 100 years; which, in an interval of 4801 years, muft have amounted to 5° 45′ 44″; which added to the preceding, gives $10^s\ 6°\ 37'$ for the true place of the moon at the commencement of the Calyougham. Now the place of this luminary, at that time, by the tables of Trivalore, is $10^s\ 6°$; the difference is lefs than two-thirds of a degree, which, for fo remote a period, and confidering the acceleration of the moon's motion, for which no allowance could be made in an Indian calculation, is a degree of accuracy that nothing but actual obfervation could have produced.—This conclufion is confirmed by a computation of the moon's place from all the tables to which the Indians could have any accefs, and of which the enormous errors would inftantly fhow the deception. Thus, by the tables of Ptolemy, the place of the fun would be 10° 21′ 15″ greater; and that of the moon 11° 52′ 7″ greater than has juft been found from the Indian tables. By thofe of Ulug Beg, the place of the fun would be 1° 30′, and that of the moon 6°, different from what it is by the Indian tables: and in like manner our author fhows that the Indian calculations could not be derived from any other fet of tables extant. In like manner, he fhows that, with regard to the mean place of the moon, there is a coincidence for a period of more than 4000 years between the tables of Mayer and thofe of India named *Chrifnabouram*; which, though they bear a more modern date than thofe of Trivalore, are thus probably more ancient.

"From

" From this remarkable coincidence (ſays Mr Playfair), we may conclude, with the higheſt probability, that at leaſt one ſet of theſe obſervations on which the tables are founded, is not leſs ancient than the era of the Calyougham: and though the poſſibility of their being ſome ages later than that epoch is not abſolutely excluded, yet it may, by ſtrict mathematical reaſoning, be inferred, that they cannot have been later than 2000 years before the Chriſtian era.

5. Since the time that M. Bailly wrote, every argument reſpecting the acceleration of the moon's motion has become more worthy of attention, and more concluſive. For that acceleration is no longer a mere empirical equation introduced to reconcile the ancient obſervations with the modern, nor a fact that can only be accounted for by hypothetical cauſes, ſuch as the reſiſtance of the ether, or the time neceſſary for the tranſmiſſion of gravity; but a phenomenon which M. de la Place has with great ability deduced from the principle of univerſal gravitation, and ſhown to be neceſſarily connected with the changes of eccentricity in the earth's orbit diſcovered by M. de la Grange: ſo that the action of the moon is indirectly produced by the action of the planets, which alternately increaſing and diminiſhing this eccentricity, ſubjects the moon to different degrees of that force by which the ſun diſturbs the time of her revolution round the earth. It is therefore a periodical inequality, by which the moon's motion, in the courſe of ages, will be as much retarded as accelerated; but its changes are ſo ſlow, that her motion has been conſtantly accelerated, even for a much longer period than that to which the obſervations of India extend.——To M. de la Grange alſo we are indebted for one of the moſt beautiful of the diſcoveries in phyſical aſtronomy, viz. That all the variations in our ſyſtem are periodical; ſo that, though every thing, almoſt without exception, be ſubject to change, it will, after a certain interval, return to the ſame ſtate in which it is at preſent, and leave no room for the introduction of diſorder, or of any irregularity that might conſtantly increaſe. Many of theſe periods, however, are of vaſt duration. A great number of ages, for inſtance, muſt elapſe, before the year be exactly of the ſame length, or the ſun's equation be of the ſame magnitude, as at preſent. An aſtronomy, therefore, which profeſſes to be ſo ancient as the Indian, ought to differ conſiderably from ours in many of its elements. If, indeed, theſe differences are irregular, they are the effects of chance, and muſt be accounted errors; but if they obſerve the laws which theory informs us they do, they muſt be held as the moſt undoubted marks of authenticity.

6. Neither theſe tables of Trivalore, nor the more ancient ones of Chriſnabouram, are thoſe of the greateſt antiquity in India. The Bramins conſtantly refer to an aſtronomy at Benares, which they emphatically ſtyle the *ancient;* and which, they ſay, is not now underſtood by them, though they believe it to be much more accurate than that by which they calculate.

20 Concluſions by Mr Playfair, concerning the Indian aſtronomy,

From theſe and other ſimilar arguments, Mr Playfair draws the following concluſions with reſpect to Indian aſtronomy. 1. The obſervations on which it is founded, were made more than 3000 years before the Chriſtian era; and, in particular, the places of the ſun and moon, at the beginning of the Calyougham, were determined by actual obſervation. 2. Though the aſtronomy now in the hands of the Bramins is ſo ancient in its origin, yet it contains many rules and tables that are of later conſtruction. 3. The baſis of their four ſyſtems of aſtronomical tables is evidently the ſame. 4. The conſtruction of theſe tables implies a great knowledge of geometry, arithmetic, and even the theoretical part of aſtronomy. All this, however, we find contraverted, or at leaſt rendered ſomewhat doubtful, by William Marſden, Eſq. who has written a paper on the chronology of the Hindoos in the Philoſophical Tranſactions for 1790.

21 controverted by Mr Marſden.

" The *Kalee Yoog* (ſays he), or principal chronological era, began in the year 3102 B. C. according to the common method of computation, or in 3101 according to the aſtronomical method, on the 18th of February, at ſunriſe; or at midnight, according to different accounts, under their firſt meridian of *Lauka.* At that period it is ſaid to be aſſerted by their aſtronomers, that the ſun, moon, and all the planets, were in conjunction according to their mean places. The reality of this fact, but with conſiderable modification, has received a reſpectable ſanction from the writings of an ingenious and celebrated member of the French academy of ſciences, who concludes that the actual obſervation of this rare phenomenon, by the Hindoos of that day, was the occaſion of its eſtabliſhment as an aſtronomical epoch. Although M. Bailly has ſupported this opinion with his uſual powers of reaſoning, and although abundant circumſtances tend to prove their early ſkill in this ſcience, and ſome parts of the mathematics connected with it; yet we are conſtrained to queſtion the verity or poſſibility of the obſervation, and to conclude rather that the ſuppoſed conjunction was, at a later period, ſought for as an epoch, and calculated retroſpectively. That it was widely miſcalculated too, is ſufficiently evident from the computation which M. Bailly himſelf has given of the longitudes of the planets at that time, when there was a difference of no leſs than 73° between the places of Mercury and Venus. But fifteen days after, when the ſun and moon were in oppoſition, and the planets far enough from the ſun to be viſible, he computes that all, except Venus, were comprehended within a ſpace of 17°; and on this he grounds his ſuppoſition of an actual obſervation.

" In their current tranſactions the inhabitants of the peninſula employ a mode of computation of a different nature, which, though not unknown in other parts of the world, is confined to theſe people among the Hindoos. This is a cycle, or revolving period, of 60 ſolar years, which has no farther correſpondence with their other eras than that of their years reſpectively commencing on the ſame day. Thoſe that conſtitute the cycle, inſtead of being numerically counted, are diſtinguiſhed from each other by appropriate names, which in their epiſtles, bills, and the like, are inſerted as dates, with the months, and perhaps the age of the moon annexed; but in their writings of importance and record, the year of *Salaban* (often called the *Saka* year) is ſuperadded; and this is the more eſſential, as I do not find it cuſtomary to number the cycles by any progreſſive reckoning. In their aſtronomical calculations we obſerve, that they ſometimes complete the year of their era by multiplying the number of cycles elapſed, and adding the complement of the cycle in which it commenced, Hindoos. menced, as well as the years of the current cycle; but from hence we are led to no ſatisfactory concluſion concerning this popular mode of eſtimating time. The preſumption is in favour of its being more ancient than their hiſtorical epochs. The preſent cycle, of which 43 complete years expired in April 1790, began in 1747, with the year of Salaban 1669, and of the grand era 4848. M. le Gentil, to whom Europe is chiefly indebted for what is known of Hindoo aſtronomy, has fallen into an unaccountable error with regard to the years of this cycle, and their correſpondence with thoſe of the Kalee Yoog, as appears by the comparative table he has given of them, and other paſſages of his work. He ſeems to have taken it for granted, without due examination, that the years 3600 of the latter muſt have been produced by the multiplication of the cycle of 60 into itſelf; and conſequently that the firſt year of this grand era muſt likewiſe have been the firſt of the cycle. But this is totally inconſiſtent with the fact; the Kalee Yoog began the 13th year of the cycle of 60; and all the reaſoning founded on the ſelf-production and harmony of theſe periods muſt fall to the ground."

From what Mr Marſden here ſets forth, it is plain that we muſt make very conſiderable abatements in our confidence of the extreme antiquity of the Hindoos obſervations. Indeed we can ſcarce conceive a poſſibility of reconciling ſuch extravagant antiquity with the authentic hiſtories of which we are poſſeſſed, or with thoſe of Scripture. The want of an ancient hiſtory of Hindoſtan leaves us indeed in the dark, and gives room for ingenious and ſpeculative men to indulge themſelves in marvellous reveries concerning their antiquity. But the flood, we know, which if it exiſted at all, could not be but general over the whole earth *, muſt have deſtroyed every monument of art and ſcience; and it is ſurely more reaſonable to believe, that M. le Gentil, or the moſt learned man in the preſent age, has been miſtaken (even though we ſhould not be able to determine the particular manner), than at once to deny the authenticity of all hiſtory both ſacred and profane, and attempt to evade evidence which no power of reaſoning can ever ſet aſide.

* See the article *Deluge*.

22 Great ſkill of the Hindoos in geometry.

It is, however, undeniable, that the progreſs of the Hindoos in geometry as well as aſtronomy has been very great in ancient times. Of this a moſt remarkable inſtance is given by Mr Playfair, in their finding out the proportion of the circumference of a circle to its diameter to a great degree of accuracy. This is determined, in the *Ayeen Akbery*, to be as 3927 to 1250, and which, to do it arithmetically in the ſimpleſt manner poſſible, would require the inſcription of a polygon of 768 ſides; an operation which cannot be performed without the knowledge of ſome very curious properties of the circle, and at leaſt nine extractions of the ſquare root, each as far as ten places of decimals. This proportion of 1250 to 3927 is the ſame with that of 1 to 3.1416; and differs very little from that of 113 to 355 diſcovered by Metrus. He and Vieta were the firſt who ſurpaſſed the accuracy of Archimedes in the ſolution of this problem; and it is remarkable that theſe two mathematicians flouriſhed at the very time that the Ayeen Akbery was compoſed among the Hindoos. In geography, however, they are much deficient; and it is very difficult to find out the true ſituation of the meridians mentioned by their authors from what they have ſaid concerning them.

23 Painting, ſculpture, &c.

The art of painting among the Hindoos is in an imperfect ſtate; nor are there any remains of antiquity which evince its ever being more perfect than it is juſt now. Their principal defect is in drawing, and they ſeem to be almoſt totally ignorant of the rules of perſpective. They are much better ſkilled in colouring, and ſome of their pictures are finiſhed with great nicety. Their ſculptures are likewiſe rude, and greatly reſemble thoſe of the Egyptians. They ſeem to follow no regular rules in architecture: their temples indeed are filled with innumerable columns, but moſt of them without any juſt ſhape or proportion. They are principally remarkable for their immenſe ſize, which gives them an air of majeſty and grandeur.

24 Muſic.

The muſic of the Hindoos is but little known to Europeans; and the art ſeems to have made but little progreſs among them in compariſon with what it has done in the weſtern countries; though ſome of the Indian airs are ſaid to be very melodious. Their muſical inſtruments are very numerous: in war they uſe a kind of great kettle-drum named *nagar*, carried by a camel, and ſometimes by an elephant. The dole is a long narrow drum ſlung round the neck; and the tam-tam is a flat kind of drum reſembling a tabor, but larger and louder. They uſe alſo the cymbal, which they name *talan*; and they have various ſorts of trumpets, particularly a great one named *tary*, which emits a moſt doleful ſound, and is always uſed at funerals, and ſometimes to announce the death of perſons of diſtinction.

25 Jugglers and enchanters of ſerpents.

The jugglers among the Hindoos are ſo expert, that many of the miſſionaries have aſcribed their tricks to ſupernatural power; and even ſo late a traveller as Mr Groſe ſeems to be not of a very different opinion *. Like the Egyptians, they ſeem to have the power of diſarming ſerpents of their poiſon, and there are many ſtrollers who go about with numbers of theſe animals in bags, having along with them a ſmall bagpipe called *magouty*, which they pretend is uſeful to bring them from their lurking places. They take the ſerpents, though of the moſt poiſonous kinds, out of the bags with their naked hands, and throw them on the ground, where they are taught to rear and move about to the ſound of their muſic. They ſay that this is accompliſhed by means of certain incantations.

* See *Ordeal*.

26 Antiquity of fire-arms among the Hindoos.

The uſe of fire-arms appears to have been of great antiquity in India. They are prohibited by the code of Gentoo laws, which is certainly of a very ancient date. The phraſe by which they are denominated is *agneeaſter*, or weapons of fire; and there is alſo mention made of *ſhet-agnee*, or the weapon that kills an hundred men at once. It is impoſſible to gueſs at the time when thoſe weapons were invented among the Hindoos; but we are certain, that in many places of the eaſt, which have neither been frequented by Mohammedans nor Europeans, rockets are almoſt univerſally made uſe of as weapons of war. The Hindoo books themſelves aſcribe the invention of fire-arms to *Baeſhkookerma*, who formed all the weapons made uſe of in a war betwixt the good and evil ſpirits. Fire-balls, or blue lights, employed in beſieged places in the night-time, to obſerve the motions of the beſiegers, are met with everywhere through Hindoſtan, and are conſtructed

Hindoos. constructed in full as great perfection as in Europe. Fireworks also are met with in great perfection; and, from the earliest ages, have constituted a principal article of amusement among the Hindoos. Gunpowder, or a composition somewhat resembling it, has been found in many other places of the east, particularly China, Pegu, and Siam; but there is reason to believe that the invention came originally from Hindostan. Poisoned weapons of all kinds are forbidden in this country.

27 Ingenuity in various arts.

The Hindoos are remarkable for their ingenuity in all kinds of handicraft; but their utensils are simple, and in many respects inconvenient, so that incredible labour and patience are necessary for the accomplishment of any piece of work; and for this the Hindoos are very remarkable. Lacquering and gilding are used all over the country, and must have been used in very early ages; though in some places the lacquering is brought to much greater perfection than in others.

28 Culture of rice.

The principal article of food throughout all Hindostan is rice, and of consequence the cultivation of it forms the principal object of agriculture. In this the most important requisite is plenty of water; and when there happens to be a scarcity in this respect, a famine must be the consequence. To prevent this as far as possible, a vast number of tanks and water-courses are to be met with throughout the country, though in some places these are too much neglected, and gradually going to decay. After the rice is grown to a certain length, it is pulled up, and transplanted into fields of about 100 yards square, separated from each other by ridges of earth; which are daily supplied with water let in upon them from the neighbouring tanks. When the water happens to fall below the level of the channels made to receive it, it is raised by a simple machine named *picoti*, the construction of which is as follows. A piece of timber is fixed upright in the ground, and forked so as to admit another piece to move transversely in it by means of a strong pin. The transverse timber is flat on one side, and has pieces of wood across it in the manner of steps. At one end of this timber there is a large bucket, at the other a weight. A man walking down the steps throws the bucket into the well or tank; by going up, and by means of the weight, he raises it; and another person standing below empties it into a channel made to convey the water into the fields. The man who moves the machine may support himself by long bamboos that are fixed in the way of a railing from the top of the piece of upright timber towards the wall.

A number of other kinds of grain are to be met with in Hindostan, but wheat is not cultivated farther south than 18° latitude. It is imported, however, to every part of the country by the Banjaries. These are a set of people belonging to no particular cast, who live in tents, and travel in separate bodies, each of which is governed by its own particular regulations. They frequently visit towns on the sea-coast, with bullocks loaded with wheat and other articles; carrying away in exchange spices, cloths, but especially salt, which they carry into the inland parts of the country. Some of their parties have several thousands of oxen belonging to them. They are rarely molested, even in time of war, otherwise than by being sometimes pressed into the service of an army to carry baggage or provisions; but

29 Account of the Banjaries.

for this they are paid, and dismissed as soon as the service is over. The Hindoos themselves are prohibited from going out of the country, under the severest of all penalties, that of losing their cast.—Notwithstanding this, however, it is certain that they do settle in foreign parts in the character of merchants and bankers. Perhaps these may have a toleration from the principal Bramin, or there may be an exemption for people of their profession; but this is not known. At any rate, wherever they go, they appear inviolably attached to their religious ceremonies, and refuse to eat what is prohibited to them in their own country. The Ryots, or people who cultivate the ground, are in many places in the most miserable situation; their only food being some coarse rice and pepper, for which they are obliged to endure all the inclemencies of a burning sun, and the inconveniencies which attend alternately wading in water and walking with their bare feet on the ground heated intensely by the solar rays; by which they are frequently blistered in a miserable manner. All this, however, they submit to with the utmost patience, and without making any complaint, expecting to be released from their sufferings by death; though even then their religion teaches them to hope for nothing more than what they call *absorption into the essence of the Deity*; a state almost synonymous with what we call *annihilation*.

30 Miserable state of the husbandmen.

HINDOSTAN, a celebrated and extensive country of Asia, bounded on the north by Great and Little Thibet; on the south, by the hither peninsula of India, part of the Indian sea, and bay of Bengal; on the west, by Persia; and on the east, by Thibet, and the farther peninsula. It is situated between 84° and 102° of east longitude, and between 21° and 36° of north latitude; being in length about 1204 miles, and in breadth 960; though in some places much less.

1 Derivation of the name.

This country was in early times distinguished among the Greeks by the name of *India*, the most probable derivation of which is from *Hind* the Persian name. We are assured by Mr Wilkins, that no such words as *Hindoo* or *Hindostan* exist in the Sanscrit or learned language of the country; in which it is named *bharata*, a word totally unknown to Europeans. The first accounts we have of Hindostan are from Herodotus, who lived 113 years before the expedition of Alexander the Great. His accounts, however, convey very little information, as he appears only to have heard of the western part of the country, and that on account of its being tributary to Persia. He informs us, that Darius Hystaspes, about 508 B. C. had sent Scylax of Caryandra to explore the river Indus. He set sail from Caspatyrus, a town near the source of the Indus, and the territories of *Pactya* (which Major Rennel supposes to be the modern *Pehkely*), and continued his course eastward to the sea; then altering his course to the west, he arrived at that place where the Phœnicians had formerly sailed round the continent of Africa; after which Darius subdued the Indians, and became master of that sea. The northern inhabitants of India, he says, resembled the Bactrians in their manners, and were more valiant than the rest; those far to the southward were as black as the Ethiopians, killed no animals, but lived chiefly upon rice; and clothed themselves with cotton. By the expedition of Alexander, the

2 Herodotus's account of India.

3 The knowledge of the Greeks augmented by Alexander's expedition.

the Greeks acquired a little more knowledge of the country of Hindostan, though he did little else than march over the tracts described by Herodotus. He was informed of the existence of the river Ganges, which had not been known to Herodotus; and the story of his supposing that he had discovered the source of the Nile, when near the head of the Indus, is well known, as well as his surprise and consternation when he arrived at the mouth of that river, on account of the high tides. Major Rennel is of opinion that both these stories are falsehoods. He thinks it is impossible that Alexander could have been ignorant of the writings of Herodotus, who gave an account of the discoveries of Scylax; and with regard to the other circumstance he expresses himself as follows. "The story of Alexander's surprise at seeing the tides in the Indus, appears to me equally improbable; seeing that the same Herodotus, book iii. speaks very particularly of the tides in the Red sea, and describes them as being not only strong, but ebbing and flowing every day. (That most intelligent and ingenious traveller M. Volney informs us, that the tide ebbs and flows three feet and a half at Suez). Arrian takes no notice of the tides until Alexander's fleet had arrived near the mouth of the river. It is true, the tide in the Indus does not go up so high as in other rivers of equal bulk, and that run on so small a descent; but nevertheless, as the tide is perceptible at 50 or 60 miles above the river's mouth, we may conclude, that it could hardly escape the notice of Alexander and his people in their voyage from Pattala to the sea, supposing they had not been apprised of the circumstance. Besides, Arrian's account of the tide which did so much mischief to the fleet, is descriptive of the *bore*, or sudden influx of the tide, in a body of water elevated above the common surface of the sea; such as occurs in the Ganges, &c. He says, those ships which lay upon the sand were swept away by the fury of the tide; while those that stuck in the mud were set afloat again without any damage. To the generality of readers no reason will appear why the circumstances of the ships should be different in the mud and on the sand: the fact is, that the bottoms of channels in great rivers are muddy, while their shallows are formed of sand; and it is the nature of the bore to take the shortest cut up a river, instead of following the windings of the channel; consequently it must cross the sand banks it meets in its way, and will also prove more destructive to whatever it meets with a-ground than what is a-float." For an account of the exploits of Alexander in Hindostan, see the article MACEDON.

4 History from the time of Alexander to that of the Mogul Mohammedans.

The Grecian expedition into India soon excited a general curiosity in the Europeans to become acquainted with a country so wealthy and so remote. Megasthenes, the ambassador of Seleucus, resided long at Palibothra the capital of an Indian nation, and from him the ancient writers learned most of what they knew concerning that part of the world. He lived about 300 years before the Christian era, and kept a journal during the time he resided in India.

For some short time the western provinces of India continued subject to the Syrian empire founded by Seleucus; but he quickly ceded these distant countries to one Sandrocottus, who gave him only 500 elephants in exchange. Soon after this the province of Bactria likewise became independent; and thus the connection betwixt India and the western parts of the world was entirely dissolved, and we are almost entirely ignorant of the transactions of that country till the time of the Mohammedan conquest. That the extensive country we now call *Hindostan* was divided among many different nations, we have no reason to doubt; but Major Rennel is of opinion, that however this might be the case, there was generally a large empire or kingdom, which occupied the principal part of that immense valley through which the Ganges takes its course; the capital of which has fluctuated between Delhi and Patna, as the limits of the empire have varied. This was named the kingdom of the *Prasij* or *Gangaridæ* in the times of Alexander and Megasthenes. Major Rennel is of opinion that it extended westward to the Panjab country; and he also thinks it probable that the capital named *Palibothra* stood on the same spot which is now occupied by the city of Patna. The kingdom, according to this supposition, would occupy part of Bengal; and he thinks that it could not be less than that of France. It was on the borders of this kingdom that Alexander's army mutinied and refused to proceed any farther. Arrian informs us, that the people were rich, excellent soldiers, and good husbandmen; that they were governed by nobility, and that their rulers imposed nothing harsh upon them.

5 No ancient Hindoo history to be credited.

The Hindoos themselves pretend to an extravagant antiquity; but we are informed by Major Rennel, that "there is no known history of Hindostan (that rests on the foundation of Hindoo materials or records) extant before the period of the Mohammedan conquests; for either the Hindoos kept no regular histories, or they were all destroyed, or secluded from common eyes by the Pundits. We may judge of their traditions by that existing concerning Alexander's expedition; which is, that he fought a great battle with the emperor of Hindostan near Delhi, and though victorious, retired to Persia across the northern mountains; so that the remarkable circumstance of his sailing down the Indus, in which he employed many months, is sunk altogether. And yet, perhaps, few events of ancient times rest on better foundations than this part of the history of Alexander, as appears by its being so highly celebrated, not only by contemporaries, but by several of the most eminent authors for some centuries following. The only traces of Indian history we meet with are in the Persian historians. In the beginning of the 17th century, Mohammed Ferishta composed a history of Hindostan, most of which was given in that of Colonel Dow, published upwards of 30 years ago; but with regard to the early part of it, Major Rennel is of opinion that it cannot at all be depended upon.

6 Expeditions of Mahmud Gazni into India.

The authentic history of Hindostan commences with the conquests of Mahmud or Mahmood Gazni, about the year 1000. His kingdom had arisen out of that of the Saracens, who under the khaliff Al Walid had extended their conquests immensely both to the east and west. Mahmud was the third from Abistagi a governor of Khorasan, who had revolted from the king of Buckharia. He possessed great part of that country formerly known by the name of *Bactria*. Gazni, Gazna, or Ghizni, was the capital; a city which stood near the source of the Indus, though Balkh likewise claimed this honour. Subactagi, the father of Mahmud, Hindoftan.

mud, had projected the conqueft of the weftern part of India; but dying before he could put his defigns in execution, Mahmud took upon himfelf the conduct of the expedition; but previous to his invafion of India, he ftrengthened himfelf by the conqueft of the whole of the ancient Bactria. His firft invafion took place in the year 1000; during which he made no farther progrefs than the province of Moultan. That part of the country was inhabited by the Kuttry and Rajpoot tribe, the Malli and Catheri of Alexander, who ftill retained their ancient fpirit, and made a very ftout refiftance to the armies of that furious enthufiaft. As he was prompted to this undertaking no lefs by a defire of exterminating the Hindoo religion than by that of conqueft, a league was at laft formed againft him among all the Indian princes from the banks of the Ganges to the Nerbudda. Their allied forces, however, were defeated, and the year 1008 was marked by the deftruction of the famous temple of Nagracut in the Panjab country. Having fatiated himfelf with plunder on this occafion, Mahmud returned to his own country; but in 1011 invaded Hindoftan once more, deftroying Tanafar a city on the weft of Delhi, and a more celebrated place of worfhip than Nagracut itfelf. Delhi was reduced on this occafion; and in feven years after Canoge was taken; the temples of Matra or Methura, the Methora of Pliny, a city of great antiquity, and remarkable for a place of worfhip near Agra, were likewife demolifhed; but he failed in his attempts on the Rajpoots of Agimere, either through their own valour or the ftrength of their country. His twelth expedition took place in the year 1024, when he deftroyed the celebrated temple of Sumnaut in the peninfula of Guzerat, adjoining to the city of Puttan on the fea-coaft, and not far from the ifland of Diu, now in the hands of the Portuguefe. In this expedition he proved very fuccefsful, reducing the whole peninfula of Guzerat, with many cities, the temples of which he conftantly deftroyed; and indeed feemed no lefs pleafed with the overthrow of the Hindoo religion than with the conqueft of the country. At his death, which happened in 1028, he was poffeffed of the eaftern and by far the largeft part of Perfia, and nominally of all the provinces from the weftern part of the Ganges to the peninfula of Guzerat; as well as thofe lying between the Indus and the mountains of Agimere; but the Rajpoots in that country ftill preferved their independency, which they have done all along, even to the prefent time.

7
Divifion of the empire of Gazna, and various conquefts in Hindoftan by different adventurers.

In the year 1158 the empire of Gazna fell to pieces from the fame caufes by which other large and unwieldy ftates have been deftroyed. The weftern and largeft part, which ftill retained the name of Gazna, was feized upon by the family of Gaurides, fo named from Gaur or Ghor, a province beyond the Indian Caucafus; while thofe contiguous to both fhores of the Indus were allowed to remain in the poffeffion of Chufero or Cufroe, whofe capital was fixed at Lahore. In 1184 the pofterity of this prince were driven out of their territories by the Gaurides; by which means the Mohammedans became neighbours to the Hindoos, and in a fhort time began to extend their dominions to the eaftward. In 1194 Mohammed Gori penetrated into Hindoftan as far as Benares, and repeated the fame fcenes of devaftation which had formerly taken place under Mahmud Gazni. At this period Major Rennel is of opinion, that the purity of the language of Hindoftan began to decline, and continued to do fo till it became what it is at prefent; the original dialect being what is called the Sanfcrit, and which is now a dead language. Mohammed Gori alfo reduced the fouthern part of the province of Agimere, and the territory to the fouth of the river Jumna, taking poffeffion of the ftrong fortrefs of Gualior. After his death in 1205, the empire of Gazna was again divided; and the Patan or Afghan empire was founded by Cuttub, who had the Indian part, the Perfian remaining to Eldoze. Cuttub fixed his imperial refidence at Delhi; and in 1210 the greateft part of Hindoftan Proper was conquered by the emperor Altumifh, the fucceffor of Cuttub. After his time the government of Bengal was always beftowed upon one of the reigning emperor's fons; and during his reign the bloody conqueror Jenghiz Khan put an end to the other branch of the Gaznian empire, known by the name of *Kharafm*; of which revolution an account is given under the article GAZNA; but Hindoftan was at that time left undifturbed. In 1242 the Moguls began to make irruptions into Hindoftan, but did not at this time make any permanent conqueft. The country was now in much the fame ftate in which it had been before the invafion of the Mohammedans, viz. divided into a great number of ftates tributary to the emperor, but in a great meafure independent; and which did not fail to revolt whenever a favourable opportunity offered. The kingdom of Malwa, which had been reduced by Cuttub in 1205, fhook off the yoke in the year 1265, and the Rajpoots were on every occafion ready to revolt, notwithftanding that their country lay in the neighbourhood of the capital. The moft dreadful maffacres, rebellions, and confufion, now took place, which, from that period almoft to the time that the Britifh government commenced, made up the hiftory of Hindoftan. The empire being parcelled out among a fet of rapacious governors, the people were reduced to the laft degree of mifery, and were at laft fo far mifled as to imagine that it was their intereft to take up arms, in order to render thefe governors independent. Had the emperors of Hindoftan confulted their true intereft, they would have given up the provinces which lay beyond the upper part of the Indus and the deferts of Agimere; as thefe formed a barrier which could not eafily be paffed by any invader. By neglecting this precaution, however, they at laft gave an opportunity to the Moguls to penetrate into their country; and thefe, after feveral invafions, became at laft fo formidable, that they were permitted by the emperors, in the year 1292, to fettle in the country. At this time the reigning emperor was Ferofe II. of the tribe of *Chilligi* or *Killigi*, fo named from Killige near the mountains of Gaur; and in 1293 this emperor projected the conqueft of the Deccan; by which was meant at that time all the territory lying to the fouthward of the Nerbudda and Mahanada and Cattack rivers; an extent of dominion almoft equal to all that he already poffeffed in Hindoftan. Ferofe was incited to attempt this by the riches of one of the princes of Deccan; and the perfon who propofed it was one Alla, governor of Gurrah, a country nearly bordering upon that which he was about to invade. Alla,

8
Firft invafion of the Moguls.

9
The country of Deccan conquered.

Alla, having accomplifhed his undertaking, during which he amaffed an incredible quantity of treafure, depofed and murdered the emperor, affuming to himfelf the fovereignty of Hindoftan. He then began a new plan of conqueft; and the firft inftance of his fuccefs was the reduction of Guzerat, a ftrong fortrefs, which had hitherto remained independent, and, while it continued fo, was a ftrong obftacle to his defigns upon the Deccan. He next reduced Rantanpour and Cheitore, two of the ftrongeft forts in the Rajpoot country. In 1303 the city of Warangole, capital of a kingdom of the Deccan named Tellingana, was reduced; but in the midft of thefe conquefts the Moguls invaded the country from an oppofite quarter, and plundered the fuburbs of Delhi. Notwithftanding this check the emperor refumed his plan of conqueft; the remainder of Malwa was fubdued; and in 1306 the conqueft of the Deccan was again undertaken. The conduct of the war was now committed to Cafoor; who not only carried his army into Dowlatabad, but, in 1310, penetrated into the Carnatic alfo. The extent of his conquefts in that country is not known; and indeed his expeditions feem to have been made with a view rather to plunder than to atchieve any permanent conqueft. The quantity of riches he amaffed was fo great, that the foldiers are faid to have carried away only the gold, leaving filver behind them as too cumberfome. As the treafure carried off on this occafion had been accumulating for a number of ages, it is probable that the country had long remained in a ftate of tranquillity.

Cafoor ftill proceeding in his conquefts, ravaged a fecond time the northern part of the Deccan, and obliged the inhabitants of Tellingana and the Carnatic to become tributary to him. Rebellions took place in 1322; but the country was again reduced in 1326, and the whole Carnatic ravaged from one fea to the other. This year Alla died, and his fucceffors, not

10 Revolts and confufion throughout the whole empire.

being poffeffed of his abilities, were unable to retain the dominions he had left. Under the emperor Mohammed III. the people of the Deccan again revolted, and drove the Mohammedans fo completely out of thefe countries, that nothing remained to them but the fortrefs of Dowlatabad. In 1344 the city of Bifnagar, properly *Bijinagur*, was founded by Belaldeo the king of Deccan, who had headed the inhabitants in their late revolt. Mahommed in the mean time attempted to extend his dominions towards the eaft; but while he employed himfelf in this, many provinces were loft by rebellions in Bengal, Guzerat, and the Panjab. His fucceffor Ferofe III. who afcended the throne in 1351, feemed more defirous of improving the remains of his empire than of extending it; and, during his reign, which continued for 37 years, agriculture and the arts were the favourite objects of his purfuit. After his death, in 1388, a rebellion and civil war took place, and continued for feveral years; and matters were brought to a crifis in the time of Mahmud III. who fucceeded to the throne in 1393; and, during this time, the empire of Hindoftan exhibited the fingular circumftance of two emperors refiding in the

11 Conquefts and maffacres of Tamerlane.

fame capital, and in arms againft each other. While matters remained in this fituation, Tamerlane, after having fubdued all the weftern part of Tartary and Afia, turned his arms againft Hindoftan in the year 1398. His conqueft was eafy, and his behaviour fuch as rendered him worthy of the name by which he is yet known in Hindoftan, "the deftroying prince." After having brought into captivity a vaft number of the poor inhabitants, he caufed a general maffacre to be commenced left they fhould join the enemy in cafe of any fudden emergency; and in confequence of this cruel order, upwards of 100,000 were put to death in one hour. In the beginning of the year 1399 he was met by the Indian army, whom he defeated with great flaughter, and foon after made himfelf mafter of the imperial city of Delhi. At this time the capital confifted of three cities, named *Old Delhi*, *Seyri*, and *Jehan Penah*. Seyri was furrounded with a wall in the form of a circle; and Old Delhi was the fame, but much larger, lying to the fouth-weft of the other. Thefe two were joined on each fide by a wall: and the third, which was larger than the other two, lay between them. As the city made no refiftance, there could not be a pretence for ufing the inhabitants with any cruelty: and thus matters paffed on quietly till the 12th of January, when the Tartar foldiers infulted fome of the inhabitants at one of the gates. The Emirs were ordered to put a ftop to thefe diforders, but found it impoffible. The Sultanas, having a curiofity to fee the rarities of Delhi, and particularly a famous palace adorned with 1000 pillars built by an ancient Indian king, went in with all the court; and the gate being thus left open for every body, above 15,000 foldiers got in unperceived. But there was a far larger number of troops in a place between the cities above mentioned, who committed fuch diforders, that an infurrection commenced; fome of the inhabitants attacking them, while others, in defpair, fet fire to their houfes, and burnt themfelves with their wives and children. The foldiers, taking advantage of this confufion, pillaged the houfes; while the diforder was augmented by the admiffion of more troops, who feized the inhabitants of the neighbouring cities that had fled to Delhi for fhelter. The Emirs caufed the gates to be fhut; but they were quickly opened by the foldiers, who rofe in arms againft their officers; fo that, by the morning of the next day, the whole army had entered, and the city was totally deftroyed. Some foldiers carried off no fewer than 150 flaves, men, women, and children; nay, fome of their boys had 20 flaves a-piece to their fhare. The other fpoils in jewels, plate, and manufactures, were immenfe; for the Indian women and girls were all adorned with precious ftones, and had bracelets and rings on their hands, feet, and even toes, fo that the foldiers were loaded with them. On the 15th the Indians attempted to defend themfelves in the great mofque of Old Delhi; but being attacked by the Tartars, they were all flaughtered, and towers erected. A dreadful carnage now enfued throughout the whole city, though feveral days elafped before the inhabitants could be forced to quit it entirely; and as they went, the Emirs took many of them into their fervice. The artifans were alfo diftributed among the princes and commanders, all but the mafons, who were referved for the emperor, in order to build him a large ftone mofque at Samarcand.

After this terrible devaftation, Tamerlane marched into the different provinces of Hindoftan, everywhere defeating the Indians who oppofed him, and flaughtering

Hindostan. ing the Ghebrs or worshippers of fire. On the 25th of March he retired, and thus set the miserable inhabitants free from the most bloody conqueror that had ever invaded them. He did not, however, disturb the succession to the throne, but left Mahmud in quiet possession of it, reserving to himself only that of the Panjab country. The death of Mahmud, which happened in 1413, put an end to what is called the Patan dynasty, founded by Cuttub in 1205. He was succeeded by Chizer, who derived his pedigree from the impostor Mohammed, and his posterity continued to enjoy it till the year 1450; when Belloli, an Afghan of the tribe of Lodi, took possession of it, the reigning prince Alla II. having abdicated the government. Under him all Hindostan was divided into separate states; and a prince, whose title was the *king of the east*, who resided at Jionpour in the province of Allahabad, became so formidable, that the king of Delhi had only a shadow of authority remaining to him. A considerable part of the empire, however, was recovered by the son of Belloli; who, in the year 1501, fixed his royal residence at Agra. During his reign the Portuguese first accomplished the passage to India by the Cape of Good Hope, but they had no connection with any other part of Hindostan than some maritime places in the Deccan which had always been independent of the court of Delhi. In 1516, during the reign of Ibrahim II. matters fell into such confusion that Sultan Baber, a descendant of Tamerlane, found means to conquer a very considerable part of the empire. His first expedition took place in the year 1518; and the year 1525 he made himself master of Delhi. In his last invasion he is said to have brought with him only 10,000 horse; having been furnished with the rest by the disaffected subjects of the emperor. During the five years that he reigned, his chief employment was the reduction of some of the eastern provinces; but he had not time to compose the disturbances which took place throughout of the whole of his dominions. On his death the seeds of rebellion, which Baber had not been able to exterminate, produced so many revolts and insurrections, that his son Humaioon, though a prince of great abilities and virtue, was driven from the throne, and obliged to take shelter among the Rajpoot princes of Agimere, where he lived in great distress. During the time of his exile his son Ackbar was born, whom Mr Rennel looks upon to be one of the greatest princes that ever sat on the throne of Hindostan. The sovereignty was held in the mean time by an usurper, named Sheerkhan, who in 1545 was killed at the siege of Cheitore, and buried in a magnificent mausoleum, of which Mr Hodges has exhibited a drawing in this country. His territories, at the time of his death, extended from the Indus to Bengal; but so unsettled was the government, that after his decease no fewer than five sovereigns appeared in the space of nine years. This induced a strong party in Hindostan to recal Humaioon; but he lived only one year after his return.

12
Reign of Ackbar, a great prince.

In 1555, Humaioon was succeeded by his son Ackbar, at that time only 14 years of age. During his long reign of 51 years, he established the empire on a more sure foundation than it had probably ever been before; though even at this time Mr Rennel is of opinion, that all the tranquillity enjoyed by the people was merely that there was no actual rebellion. The first years of his reign were spent in reducing the provinces which had revolted from Agimere to Bengal; and the obedience of these he took care to secure as well as possible by a careful choice of governors; particularly by an unlimited toleration in religious matters, and an attention to the rights and privileges of the people. In 1585, he resolved to invade the Deccan, which had hitherto resisted the power of the Mogul princes. The war continued for 20 years; during all which time no farther progress was made than the reduction of the western part of Berar, Candeish, Tellingana (a division of Golconda), and the northern part of Amednagur; the capital of which, named also *Amednagur*, was taken in 1601, after a long and bloody siege, and an unsuccessful attempt of the princes of the Deccan to relieve it.

13
Bad conduct of his successors.

Under his successor Jehan Guire, the project was but faintly carried on; the empire was disturbed by the rebellion of Shah Jehan the emperor's son; and the influence of Noor Jehan his mistress perplexed the councils of the nation. In this prince's reign Sir Thomas Roe, the first English ambassador, arrived at the court of Hindostan. The Portuguese had now acquired considerable possessions in Guzerat and Bengal, but only those in the former provinces attracted the attention of the court; so that the Persian historian takes no notice of those in Bengal. In the reign of Shah Jehan, who succeeded his father Jehan Guire in 1627, the conquest of the Deccan was more vigorously pushed than before; and the war was carried on in such a destructive manner, that most of the princes in those parts were fain to make submission to the emperor. During this reign a war took place with the Portuguese, which ended in the expulsion of the latter from Hoogly on the Ganges. In his private character Shah Jehan was a very debauched and wicked prince, which gave occasion to one of his sons named *Aureng-zib*, or *Aureng-zebe*, to dethrone him.

14
The empire raised to its greatest height by Aureng-zebe.

This prince attained his end by a train of deep hypocrisy and dissimulation; covering his ambition with a pretence of religion, and under that pretence committing the greatest crimes. He engaged in a war with two of his brothers, both of whom he defeated by unforeseen accidents, when he himself seemed to be on the brink of destruction. Having at last got them into his power, he put them both to death, and then lamented their misfortunes. One of his brothers who assisted him, was rewarded first with imprisonment, and then with death. By the year 1660, he had attained full possession of the sovereignty, and from that time to the year 1678 there reigned a profound tranquillity throughout the whole empire. In the latter part of his reign he undertook the conquest of the Deccan, to which he was supposed to be incited by the resolution and growing power of Sevagee, the founder of the Mahratta state; and who, in that character, appeared almost as a rival to Aureng-zebe himself. Having quelled a rebellion of the Patans, who lived beyond the Indus, he persecuted the Hindoos to such a degree, that the Rajpoot tribes in Agimere commenced a war against him. On this occasion he headed his armies also in person; but having the misfortune to be hemmed in among the mountains, he would certainly have been taken prisoner, had not the enemy thought proper to allow him to escape. They allowed also the empress to make her escape, after she had been actually taken,

taken. In 1681 he renewed his incurſions into that country, took and deſtroyed Checture, committing other devaſtations, and everywhere deſtroying the Hindoo temples and objects of worſhip; but notwithſtanding all his efforts, he was at laſt obliged to abandon his enterpriſe, and allow them to remain in peace. From the year 1678 to the time of his death in 1707, he is ſaid to have been chiefly employed in the Deccan, the greateſt part of which he reduced, and for the laſt five years of his life is ſaid to have been actually employed in the field. This long abſence from his capital could not but be productive of bad conſequences. Rebellions broke out in various parts of the empire; and during this period, the Jats or Jauts firſt made their appearance in the province of Agra. They were at firſt only a ſet of banditti; but have ſince grown to be a very conſiderable ſtate, and once were of ſome conſequence in Upper Hindoſtan. After the 10th year of Aureng-zebe's reign, however, we know very little of his tranſactions, as he would not allow any hiſtory of it to be written. At the time of his death the empire extended from the 10th to the 35th degree of latitude, and almoſt as many degrees in longitude. "His revenue (ſays Major Rennel) exceeded 35 millions of pounds Sterling, in a country where the products of the earth are about four times as cheap as in England. But ſo weighty a ſceptre could be wielded only by a hand like Aureng-zebe's; and we accordingly find, that in a courſe of 50 years after his death, a ſucceſſion of weak princes and wicked miniſters reduced this aſtoniſhing empire to nothing."

15 Its quick decline under his ſucceſſors.

Aureng-zebe left four ſons; Mauſum, afterwards emperor, under the title of Bahader Shah; Azem, Kaum Buſh, and Acbar, who had been obliged to fly to Perſia 30 years before on account of his having engaged in rebellion againſt his father. A civil war inſtantly commenced between Azem and Mauſum; the event of which was decided in a great battle, where 300,000 combatants were brought into the field on each ſide. In this battle Azem was defeated and killed; after which Mauſum aſcended the throne by the title of Bahader Shah. He was a prince of conſiderable abilities; but the diſorders of the empire were already riſen to ſuch an height, that during his ſhort reign of five years, he found it impoſſible to compoſe them. He was firſt engaged in war with his brother Kaum Buſh, whom he alſo defeated and killed; after which his attention was engaged by the Seiks, a new ſet of religioniſts, who, during the reign of Shah Jehan, had ſilently eſtabliſhed themſelves along the foot of the eaſtern mountains. They now appeared in arms in the province of Lahore, and ravaged the whole country from thence to the banks of the Jumna. The emperor marched againſt theſe adverſaries in perſon, and with great difficulty brought them under ſubjection. He then took up his reſidence at Lahore, where he died after a ſhort illneſs, without having ever viſited the imperial cities of Agra or Delhi.

After the death of Bahader Shah the empire was again conteſted among his four ſons. Of theſe the ſecond, named Azem Ooſhaun, took poſſeſſion of the treaſures; but was oppoſed by his three brothers, who agreed to divide the empire among them. Azem was defeated and killed in a battle, gained chiefly by the valour and conduct of the youngeſt named *Shah Jehan*; who ſeemed reſolved to abide by the agreement, and as a proof of his ſincerity, ordered the treaſures to be divided. This was prevented by the intrigues of Zoolfecar-khan, an omrah in high truſt. A new civil war commenced, in which Jehan Shah was killed. The two remaining brothers tried their fortune in a third battle, which left Jehauder, the eldeſt, in poſſeſſion of the throne. In nine months he was dethroned by Ferokſere, or Furrokſere, ſon to the deceaſed Azem Ooſhaun; having, during his ſhort reign, diſplayed almoſt unparalleled meanneſs of ſpirit.

This revolution was accompliſhed by the aſſiſtance of two brothers, Houſſein Ali Khan and Abdoolla Khan, who had extenſive governments in the eaſtern provinces. The calamities of the empire were not at all abated during this reign. In 1713 the Seiks appeared again in arms; and in 1716 were grown ſo formidable, that the emperor himſelf was obliged to march againſt them; but we are totally ignorant of the particulars of this campaign. About this time the Engliſh Eaſt India company obtained the famous *Firman* or grant, by which their goods of export and import were exempted from duties or cuſtoms; which was regarded as the company's commercial charter in India, while they ſtood in need of protection from the princes of that country.

15 Firman granted to the Eaſt India company.

Ferokſere was depoſed, and his eyes put out, by the two brothers who had raiſed him to the throne; and in the courſe of the ſame year two other emperors, whom they afterwards ſet up, were depoſed and murdered; and thus, in eleven years after the death of Aureng-zebe, 11 princes of his line, who had either mounted the throne, or been competitors for it, were exterminated, while the government declined with ſuch rapidity, that the empire ſeemed ready to be diſmembered to a greater degree than it had even been before the invaſion of Tamerlane. In 1718, the two brothers raiſed to the throne Mohammed Shah, the grandſon of Bahader Shah; but this prince having got ſufficient warning by the fate of his predeceſſors, took care to rid himſelf of theſe powerful ſubjects, though this could not be accompliſhed without a civil war. New enemies, however, ſtarted up. Nizam-al-Muluk, viceroy of the Deccan, had been for ſome time augmenting his power by every poſſible method, and was evidently aſpiring at independence. Having received ſome affronts from the two brothers, who for ſome time had ruled every thing with an abſolute ſway, he thought proper to retire to his government. In 1722 he was invited to court, and offered the place of vizier or prime miniſter, but declined accepting it, while the growing and formidable power of the Mahrattas furniſhed him with a pretence for augmenting his army. At laſt, having by the year 1738 attained a ſufficient degree of ſtrength to accompliſh his purpoſes, and confident of his having a large party at court, he came thither attended by a great body of armed followers. Finding, however, that the intereſt of the emperor was ſtill too powerful for him, he invited the celebrated Perſian uſurper Nadir Shah, commonly known by the name of *Khouli Khan*, to invade Hindoſtan. The invitation was accepted, and Nadir entered the country without oppoſition. The imperial general Douran being killed in a ſkirmiſh, no deciſive engagement took place; and the Perſian chief, though far advanced into Hindoſtan, yet

17 Invaſion of Nadir Shah.

Hindoſtan. yet looked upon matters to be ſo uncertain, that he offered to evacuate the country and retire for 50 lacks of rupees, about half a million ſterling. The intrigues of the Nizam and his party hindered the emperor from complying with this moderate demand; inſtead of which he abſurdly threw himſelf upon the uſurper's mercy, who then took poſſeſſion of Delhi, demanding a ranſom of 30 millions ſterling. At an interview with the emperor, he ſeverely reprimanded him for his miſconduct; however, he told him, that as he was of the race of Timur (Tamerlane), who had not offended the reigning family of Perſia, he would not take the empire from him; only as he had put him to the trouble of coming ſo far to ſettle his affairs, he inſiſted that his expences ſhould be paid. The unfortunate emperor made no anſwer to this ſpeech; but Nadir took care to enforce the latter part of it. Some time after the departure of the emperor, Nadir went to the camp to pay him a viſit; where he ſeized upon 200 cannon, with ſome treaſure and valuable effects, ſending them off immediately to Candahar. He then marched back to Delhi, where a mob aroſe about the price of corn. As Nadir Shah was endeavouring to quell it, a muſket was deſignedly fired at him, by which he narrowly eſ-

18 Inhabitants of Delhi ſlaughtered.

caped being killed. Exaſperated at this, he commanded an indiſcriminate maſſacre to be made, which his cruel ſoldiers inſtantly put in execution with the greateſt alacrity, and 120,000, or, according to others, 150,000, of the miſerable inhabitants were ſlaughtered without mercy. This was followed by a ſeizure of all the jewels, plate, and valuable articles which could be found, beſides the exaction of the 30 millions, which was done with the utmoſt rigour; inſomuch that many of the inhabitants choſe rather to put an end to their own lives than to bear the torments to which they were ſubjected in caſe of inability to pay the ſum impoſed upon them. During theſe horrid ſcenes, Nadir cauſed the marriage of his ſon to be celebrated with a grand daughter of Aureng-zebe; and after having extorted every thing which he demanded, at laſt took leave of the emperor with every mark of friendſhip. He put the crown upon his head with his own hands; and after having given him ſome ſalutary advice relative to the government of his empire, he ſet out from Delhi on the 6th of May 1739.

19 Miſerable ſtate of Hindoſtan after his departure.

By this invaſion the empire ſuſtained prodigious loſs. Since the arrival of Nadir in Hindoſtan, about 200,000 people had been deſtroyed, and goods and treaſure carried off to the amount of 125 millions ſterling. Mohammed had ceded to the uſurper all the provinces of Hindoſtan ſituated to the weſt of the Indus. His departure left the Nizam in poſſeſſion of all the remaining power of the empire, which he inſtatly made uſe of to eſtabliſh himſelf in the ſovereignty of the Deccan. The province of Bengal had already become independent under Aliverdy Cawn, in the year 1738; and not long after, it was invaded by a vaſt army of Mahrattas under ſanction of the emperor's name; who being unable to ſatiſfy them in the arrears of tribute he had been obliged to conſent to pay, ſent them into Bengal to collect for themſelves. About the ſame time, the Rohillas, a tribe from the mountains which lie between India and Perſia, erected an independent ſtate on the eaſt of the Ganges, within 80 miles of Delhi.

The total diſſolution of the empire ſeemed now to be faſt approaching. In the confuſion which took place after the murder of Nadir Shah, Abdallah, one of his generals, ſeized upon the eaſtern part of Perſia, and the adjoining provinces of India, which had been ceded to Nadir by Mohammed Shah; which he formed into a kingdom ſtill known by the name of *Candahar* or *Abdalli;* of which a more particular account is given in the ſubſequent part of this article.

This year Mohammed Shah died, after a reign of 29 years; which, conſidering the fate of his immediate predeceſſors, and the anarchy univerſally prevalent throughout Hindoſtan, muſt be accounted very wonderful. He was ſucceeded by his ſon Ahmed Shah; during whoſe reign, which laſted about ſix years, the total diviſion of the remainder of the empire took place. Nothing now remained to the family of Tamerlane but a ſmall tract of territory round the city of Delhi, now no longer a capital, and expoſed to the repeated depredations of invaders, with conſequent maſſacres and famines. The laſt army which could with propriety be termed *imperial*, was defeated by the Rohillas in 1749; by which their independence was fully eſtabliſhed in the eaſtern parts of the province of Delhi. The Jauts, or Jats, a Hindoo tribe, eſtabliſhed themſelves in the province of Agra; the Deccan and Bengal were ſeized upon by their viceroys, Nizam and Aliverdy. Oude was ſeized on by Seifdar Jang (father to the late Sujah Dowlah); Allahabad by Mohammed Kooli. Malwa was divided between the Poonah Mahrattas and ſeveral native princes and Zemindars: Agimere reverted of courſe to its ancient lords, the Rajpoot princes; and the Mahrattas, in addition to their proper ſhare of Malwa, poſſeſſed the greateſt part of Guzerat, Berar, and Oriſſa; beſides their ancient dominions in the Deccan. Theſe people were now become ſo powerful, that they were alternately courted and employed by the contending parties, like the Swiſs in Europe; with this difference, that the Swiſs are paid by thoſe who employ them, whereas the Mahrattas always take care to pay themſelves. Abdalla having eſtabliſhed his empire in the manner above related, entered Lahore and Moultan, or the Panjab, with a view to conqueſt. "The whole country of Hindoſtan was in commotion (ſays Major Rennel) from one entrance to the other, each party fearing the machinations of attacks of the other; ſo that all regular government was at an end, and villainy was practiſed in every form. Perhaps in the annals of the world it has ſeldom happened that the bonds of government were ſo ſuddenly diſſolved, over a portion of country containing at leaſt 60 millions of inhabitants.

20 Firſt interference of the French and Engliſh in the affairs of Hindoſtan.

In 1748 the Nizam died at the age of 104, and was ſucceeded by his ſon Nazirjung, to the prejudice of his eldeſt brother Gazi, vizier to the nominal emperor. The conteſt that followed on this occaſion for the throne of the Deccan, and nabobſhip of Arcot, firſt engaged the French and Engliſh as auxiliaries on oppoſite ſides. This was followed by a long ſeries of hoſtilities, which terminated in the total expulſion of the French from Hindoſtan, the entire humiliation of the Mogul, and his being reduced to the ſtate of dependence on the Engliſh Eaſt India company; together with the ſubjection of a vaſt tract of country to the latter. Theſe tranſactions have occaſioned very conſiderable revolutions, not only in the country properly called *Hindoſtan*, Hindoftan.

Hindoftan, but in other places of that extenfive tract called the *Eaft Indies:* for an account of which, and of fome later revolutions, fee the article INDIA.

21 Different powers among which Hindoftan is divided.

The vaft country of Hindoftan, before the revolutions alluded to, was divided among the following powers.

1. Timur Shah, fon of Ahmed Shah, or Abdallah, poffeffed an extent of territory to the north-weftward before we come to the river Indus. This country, extending all the way betwixt India and Perfia, is known by the name of *Duran*, or *Turan;* and was poffeffed by the Afghans, of whom Abdallah became the fovereign. He was defcended from an illuftrious family; and having the misfortune of being taken prifoner by Huffein Khan, then chief of Candahar, along with his brother Zulfecur Khan, they were releafed by the celebrated Nadir Shah in his paffage through that country to Hindoftan; but as that conqueror ftill looked upon them with a jealous eye on account of their great influence with their countrymen, both were fent to Mazandaran in Perfia. Here Zalfecur Khan, the brother of Achmed, died; and, fome time after, we find the latter promoted to the command of a body of Afghan cavalry in the Perfian army. He continued attached to the interefts of Nadir while that conqueror lived; and even attempted, though ineffectually, to revenge his death. Proving unfuccefsful in this attempt, he returned to his own country; and, arriving at Candahar, was faluted chief of the Afghans. In the courfe of a few months he became mafter of all the countries which the Mogul had been obliged to cede to Nadir Shah; and, encouraged by the diftracted ftate of the affairs of Hindoftan at that time, he croffed the Indus, and plundered the country to the fouth-eaft. An indecifive battle fought with the Indian army under the command of the prince royal and vizier, in which the latter was killed, obliged Ahmed to return to his own territories; but he foon undertook another expedition, in which he conquered the province of Lahore. In 1755 he returned; and after ftaying fome time at Lahore, marched to Delhi the capital, having been invited thither, as was fuppofed, by the Mogul himfelf, in order to get rid of the tyranny of his vizier. The latter was accordingly deferted in a battle by orders of the emperor, and obliged to furrender himfelf prifoner; but inftead of being put to death, he had the addrefs to ingratiate himfelf with the conqueror; and the unfortunate Allumghire, the Mogul, was obliged to fubmit to be ruled by him as before. Ahmed took care to indemnify himfelf for his trouble, by laying the city of Delhi under a heavy contribution; and having ftaid for about a month, during which time he concluded a marriage betwixt his fon Timur and the emperor's niece, he marched againft a tribe of Hindoos named the *Jauts*, and conquered the greateft part of the province of Agra. In this expedition he furprifed the city of Matra, famous for being the birth-place of *Krifhen*, the Apollo of the Hindoos; and facrificed to the *Gopia*, the mufes of the country. He failed in his attempt to furprife Agra through the refolution of Fazil Cawn the governor; after which he led back his troops to Delhi, where he married the daughter of Mohammed Shah the late emperor, whom Allumghire had in vain folicited for himfelf.

Having fettled his fon Timur in the government of Lahore, Ahmed quitted Hindoftan, and returned to his dominions, where he found every thing in confufion. Timur, who during his father's abfence had been frequently difturbed by the Seiks, a tribe of Hindoos who profefs deifm, was in 1760 driven out by a vaft army of Mahrattas commanded by Ragonaut Row the Peifhwa's brother, of whom fo much mention has already been made. Next year, however, Ahmed croffed the Indus, and eafily recovered his former territories; foon after which he became head of a league formed among fome of the Indian princes, in order to oppofe the overgrown power of the Mahrattas. In this enterprife he proved fuccefsful; and overthrew the Mahrattas in a decifive and very bloody battle, in which more than 50,000 of them were killed on the fpot. The purfuit lafted feveral days, and their vaft army was totally difperfed; Ahmed being every where received with acclamations as the deliverer of the faithful. In 1762 he again croffed the Indus, with a view to conquer, or rather to exterminate, the Seiks, whofe incurfions had become very troublefome, and even dangerous to his kingdom. Having defeated their army, and forced them to take refuge in the woods and ftrong holds, he fet a price on the heads of all thofe who profeffed their tenets; and that with fuch fuccefs, that heaps of them are faid to have been piled up in all the principal towns in thefe parts. At laft, hearing that they had affembled in great numbers to celebrate an annual feftival, he marched with an army to furprife them. The Seiks, however, were well provided for his reception, and an obftinate battle enfued. During the time of the engagement an eclipfe of the fun happened, which, though difregarded by the Seiks, greatly difmayed the fuperftitious Mohammedans. Ahmed was therefore defeated; and though he frequently returned, was never able thoroughly to fubdue that people. At laft, having been long afflicted with an ulcer in his face, he died on the 15th of July 1773, at a place name *Kohtoba*, among the mountains of Candahar, to which he had retired for the fake of coolnefs, and was fucceeded by his fon Timur, who ftill continues to enjoy the fovereignty. The dominions of this prince extend a very confiderable way to the northward of the Indus, but he poffeffes nothing in Hindoftan befides the province of Kafhmire.

2. The Seiks inhabit a country on the other fide of the Indus, and making part of Hindoftan properly fo called. They derive their origin from a Hindoo named *Nanuck* of the caft of Khatry. His father, named *Baba Caloo*, poffeffed a fmall diftrict in the province of Lahore named *Telvandi*, where Nanuck was born in the year 1470. Like other founders of new fects or nations, he is faid during his infancy to have given many indications of his future fuperiority to the reft of mankind. He feems, however, to have received no farther education than what was common to young men of his caft, viz. reading, writing, and arithmetic, and hearing the faftras or commentaries on the facred books. In his early youth he was married to a woman of his own caft, by whom he had two fons. Being a convert to the worfhip of the Invifible, or deifm, he accuftomed himfelf to declaim againft the folly of worfhipping idols, and the impiety of paying adoration to any but the Supreme Being. At the age of 25 he left his

his family to viſit Bengal and the eaſtern parts of Hindoſtan; in a ſecond journey he viſited the ſouthern, and in a third he went as far as Perſia and Arabia. On his return from this laſt journey, he expreſſed a deſire of remaining in his native country; and was furniſhed, according to his wiſh, with a piece of ground on the banks of the river Bavy, about 80 miles north-eaſtward from the city of Lahore. Here he took up his reſidence for the reſt of his days; and chooſing to be free from the cares of this world, he dwelt at a diſtance from his wife and children, who came occaſionally to viſit him. Having acquired great reputation for his piety, wiſdom, and learning, he died at the age of 70; and ſince his death the place of his abode has obtained the name of *Dihra Daira*, or "the place of worſhip." His eldeſt ſon founded a ſect of devotees named *Nanuck Shoiy;* but his ſecond employed himſelf in the uſual occupations of mankind. On account of the oppreſſion of the Mohammedan governors, however, he removed from Telvandi, the eſtate of his anceſtors, and ſettled at Kartarpour, which his deſcendants ſtill poſſeſs. They are reſpected by the Seiks on account of their being the poſterity of Nanuck, but are not held in any veneration on a religious account.

The doctrines of Nanuck were taught by a favourite diſciple of his named *Lhina*, but on whom he beſtowed on his death-bed the appellation of *Angud*. By him the doctrines of the ſect were collected in a work named *Pothy*, or "the book"; and an hiſtory of the life of Nanuck himſelf was given in another named *Jenum Sakky*. Both theſe were written in a particular kind of character called *Gour Mouekty*, and ſaid to have been invented by Nanuck himſelf. Angud named for his ſucceſſor another diſciple called *Amerdoſs;* and this method of continuing the ſucceſſion ſeems to have been practiſed as long as the diſciples continued to own one ſupreme chief.

For many years the Seiks lived in peace, and gained the good-will of the Mohammedan governors by their quiet and inoffenſive behaviour. By degrees their numbers and their power greatly increaſed, but in proportion to their good fortune, they ſeem to have loſt their virtue; ſo that their gourous, or chiefs, who had hitherto borne the character of apoſtles, at laſt ſtood forth as military leaders. The firſt of theſe was named *Taigh*, whoſe ſucceſſor, named *Govand Sing*, was the tenth and laſt of the gourous. He engaged in a rebellion againſt the government; but was at laſt obliged to ſubmit, and even attended the emperor Bahader Shah in perſon. At laſt he was aſſaſſinated by a Petan ſoldier, not without a ſuſpicion of the emperor himſelf being concerned. As he did not name a ſucceſſor, his followers choſe a chief for themſelves named *Banda*, who ſoon began to make depredations on his neighbours; but being at laſt taken priſoner, and ſent to Delhi with his family and many of his countrymen, they were all put to an ignominious death. By this execution the Seiks were ſo much exaſperated, that they ſwore eternal vengeance againſt the Mohammedans, and have ever ſince manifeſted a moſt implacable hatred againſt them. Taking advantage of the diſtraction of the Mogul empire by the invaſion of Nadir Shah, they conquered ſeveral provinces. Wherever they came they threw down the moſques, and obliged every one to quit the country who refuſed to embrace their tenets. The war with Ahmed Shah has been already mentioned. Since his death they have recovered all the territories they loſt during their conteſt with him; and now poſſeſs the greateſt part of Moultan, as well as ſeveral diſtricts in the province of Delhi; including in their territories the whole of that rich country named the *Panjab*, on account of five rivers which deſcend from the northern mountains, and incloſe or interſect it, running afterwards into the Indus.

The Seiks, as has already been mentioned, worſhip one God; but without image, or believing in any mediator. They eat all kinds of meat except beef; ſparing the black cattle, in all probability, on account of their utility. Pork is very generally eaten, probably on account of its being forbidden by the Mohammedans. They are commonly dreſſed in blue, a colour reckoned unlucky by the other Hindoos. Their dreſs conſiſts of blue trowſers of cotton, a ſort of plaid generally chequered with blue and thrown over the right ſhoulder, with a blue turban. Their government is lodged in an aſſembly of different chiefs; but, who, as individuals, are independent of one another, and have ſeparate territories. They meet annually, or oftener if occaſion requires, at a place called *Antberſer*, which is held in a kind of religious veneration; where there is a large tank lined with granite, and ſurrounded with buildings, and beautifully ornamented. Their force is very conſiderable, amounting to no fewer than 200,000 cavalry. However, they can ſeldom be brought to act in concert, unleſs the whole nation be threatened with ſome imminent danger. They are a ſtrong hardy race of men, and capable of bearing much fatigue; and ſo expert in war, that of late almoſt all the neighbouring countries have been laid under contribution by them, ſeveral petty chiefs having conſented to pay them a ſmall annual tribute in order to avoid their incurſions. When in the field, none but the principal officers have tents, and thoſe extremely ſmall, ſo that they may be ſtruck and tranſported with the greater quickneſs and facility. In cold weather the ſoldiers wrap themſelves during the night in a coarſe blanket, which in the time of marching is folded and carried on their horſe. Their country is well cultivated, populous, and abounding in cattle, particularly horſes, which are reckoned the beſt in all Hindoſtan. This may probably be owing to the ſtuds which were formerly eſtabliſhed in different places of the province of Lahore on account of the Mogul himſelf. Stallions were ſent thither from Perſia and Arabia, and there was a fixed order to ſend to the ſtuds in Lahore all ſuch Arabian and Perſian horſes as by any accident ſhould be rendered unfit for mounting. Notwithſtanding their deiſm, the Seiks are ſaid to have a ſuperſtitious veneration for their ſword; inſomuch, that before one of them will eat with a perſon of another religion, he draws his ſword, and paſſing it over the victuals, repeats ſome words of prayer, after which he will freely partake of them. Contrary to the practice of all the other Hindoos, they diſlike the ſmoking of tobacco; but many of them ſmoke and chew bang, which ſometimes produces a degree of intoxication.

3. The provinces of Delhi have, in the courſe of a few years, frequently changed their maſters, but have

fcarce at any period during that time been under the authority of the fovereign. Their laft governor was named *Nadjiff Khan*, under the title of generaliffimo of the emperor. He was involved in the ruin of Mohammed Kouly Khan, coufin to Soujah al Dowlah: after which he went to Caffim Aly Khan nabob of Bengal; after whofe expulfion he retired with a party of horfe to Bundelcund into the fervice of Rajah Coman Sing. He next joined the Englifh; and at laft became the general of Shah Allum. With a body of Englifh feapoys who had been put under his command, and fome other troops whom he had taken into his fervice, he fubdued the countries near Delhi, conquered almoft all the territories of the Jauts, reducing the cities of Agra, Dieg, and other principal towns. Thefe conquefts were indeed effected in the name of the Mogul, but he derived little benefit from them; Nadjiff being the real mafter, and keeping poffeffion of them till his death, which happened in 1782: and fince that time the countries we fpeak of have been involved in a fcene of continual anarchy and bloodfhed.

4. Next to the provinces of Delhi are the dominions of the independent rajahs, whofe dominions lie contiguous to one another. The principal are thofe of Joinagar or Jaypour, Joadpour or Marwar, Oudiapour or Chitore, and Jefalmire. Thefe countries are under a kind of feudal conftitution, and every village is obliged to furnifh a certain number of horfemen at the fhorteft warning. The people are brave, hardy, and very much attached to their refpective chiefs; and their army is very formidable, amounting when collected to about 150,000 horfemen.

5. The Jauts were a tribe who followed the occupation of agriculture in the northern part of Hindoftan. About 40 years ago they were formed into a nation by Tackou Souragemul, proprietor of an inconfiderable diftrict. After making himfelf mafter of all the countries dependant on Agra, of the town itfelf, and many other important places, he was killed in battle with Nadjib ul Dowlah, the Rohilla chief, in 1763. Since that time the power of this people has been fo much reduced by domeftic contentions and foreign wars, that the prefent rajah poffeffes only a ftrong town named *Bartpoor*, with a fmall diftrict around it. The Jauts, however, it is faid, are now manifefting a martial difpofition, and thus may poffibly be foon in a condition to recover their former extent of territory.

6. The moft confiderable of all the Hindoo powers are the Mahrattas, with whom the Europeans firft became acquainted in their original territories of Malabar. The firft of their chiefs was named *Seeva*, or *Seeva-jee;* who is faid to have been defcended from the ancient Hindoo emperors, and whofe father was lord of a fmall diftrict, for which he paid tribute to the Mohammedan king of Viziapour. For fome reafon, unknown to us, he was at laft arrefted by order of that king, and died in confinement; but his fon Seeva-jee took up arms in defence of his country, and made himfelf mafter of feveral important places, with a confiderable tract of territory, which were afterwards ceded to him by the queen-regent, the king of Viziapour having died foon after the commencement of the war.

Seeva-jee having thus eftablifhed himfelf, foon became formidable to his neighbours. Many of the Hindoo princes put themfelves under his protection, and he at length ventured to make war upon the emperor Aurengzebe. In this he proved unfuccefsful, was taken prifoner, and carried to Delhi. Having found means, however, to make his efcape, he quickly recommenced hoftilities; and the emperor, who was now far advanced in life, thought proper to come to an accommodation with fo troublefome an enemy. On this occafion the Mahrattas pretend that their prince obtained a grant of 10 per cent. on all the revenues of the Deccan; which has often ferved as a pretence to invade that country, and levy contributions on the fouthern nabobs. Since that time the Mahrattas have become fo powerful, that all the princes of Hindoftan are alarmed when they put themfelves in motion. Their territories extend about 1000 miles in length and 700 in breadth; and they are governed by a number of feparate chiefs, all of whom acknowledge the Ram Rajah as their fovereign, and all except Moodajee Booflah acknowledge the Paifhwa as his vicegerent. The capital of the fovereign was Sattarah; but the Paifhwa generally refides at Poonah, one degree to the fouthward, and about 100 miles diftant from Bombay. The country extends along the coaft nearly from Goa to Cambay. On the fouth it borders on the territories of Tippoo Saib; on the eaft it has thofe of the Nizam and the rajah of Berar; and on the north thofe of the Mahratta chiefs Sindia and Holkar.

7. The rajah of Berar, befides that country, has the greateft part of Orixa. His dominions extend about 600 miles in length from eaft to weft, and 250 from north to fouth. The eaftern part of Orixa extends along the fea-coaft for about 150 Englifh miles, and divides the Britifh poffeffions in Bengal from thofe commonly called the *Northern Circars*. On the weft his territories border upon thofe of the Paifhwa; on the fouth, upon thofe of the Nizam, Mahomet Hyat a Patan chief, Nizam Shah, and Ajid-Sing. The rajah himfelf refides at Nagarpour, about midway betwixt Calcutta and Bombay.

8. Madajee Sindia has the greateft part of the government of Malva, together with the province of Candeifh. The remainder is under the government of Holkar; who, as well as Sindia, pretends to be defcended from the ancient kings of Malva. The principal refidence of Sindia is at Ugein near the city of Mundu, which was once the capital of thefe kings. Holkar refides at Indoor, a town little more than 30 miles to the weftward of the former. The dominions of thefe, and fome other princes of fmaller note, extend as far as the river Jumma.

The two laft mentioned princes, though properly Mahrattas, own no allegiance to the Ram Rajah, or great chief to whom the main body are nominally fubject. Some time ago the Mahrattas aimed at the conqueft of all Hindoftan, and even avowed a defign of expelling all the Mohammedan princes; but their power was effectually checked by the Britifh, and their diffenfions among themfelves put an end to all fchemes of that kind. Still, however, they were ready to watch every opportunity of invading the territories of their neighbours; and their refources being fo confiderable, they were defervedly accounted a very formidable enemy. The ftrength of their army confifts chiefly in cavalry; and both men and horfe are capable of enduring a great deal

deal of fatigue. Bodies of 50 or 60,000 cavalry have been known to travel 50 miles a day for many days together; which, conſidering the exceſſive heat of the country, muſt certainly appear very ſurpriſing. The country abounds very much in horſes, and there is one kind named the *Bheemerteddy* horſe, which is greatly eſteemed, and ſold at a very high price. The common horſe of theſe parts is lean and looks ill, but is abundantly fit for the purpoſes of war. The only weapon uſed by the horſemen is a ſabre; in the uſe of which they are ſo dexterous, that it is ſuppoſed the beſt European huſſar would not be more than a match for a Mahratta horſeman. There are conſiderable ſtuds in every province belonging to the Paiſhwa and different chiefs; and there are likewiſe many *jundis* or great herds of horſes belonging to particular perſons, who turn thoſe they have no occaſion for looſe in the open plains.

The Mahratta horſemen are dreſſed in a quilted jacket of cotton, which is ſuppoſed to be one of the beſt defences againſt a ſword that can eaſily be contrived of equal lightneſs; but the heat of the climate frequently renders it neceſſary to be taken off. The reſt of their dreſs conſiſts of a pair of trowſers, and a kind of broad turban which deſcends low enough to cover the neck and ſhoulders. In caſes of emergency the horſemen carry proviſion both for themſelves and their horſes in ſmall bags tied npon the ſaddles: the food of the rider conſiſts only of a few ſmall cakes with a little flour or rice, and ſome ſalt and ſpices; the horſe is fed with a kind of peas named *gram*, or with balls made of the flour of theſe peas mixed with butter, prepared after a certain manner, and named *ghee*, together with ſome garlic and hot ſpices. Theſe balls are given by way of cordial, and have the property of invigorating the animal after extraordinary fatigue. Sometimes it is ſaid that they add a ſmall quantity of *bang;* a kind of drug which poſſeſſes an exhilarating virtue, and produces ſome degree of intoxication. The Mahratta cavalry ſeldom make any uſe of tents; even the officers frequently have no other accommodation than a ſmall carpet to ſit and lie on; and a ſingle camel is able to carry the whole baggage of the general. The officers, however, are generally well mounted, and have ſpare horſes in the field.

All the ſubjects and vaſſals of the Mahratta princes are generally ready to follow them into the field; and in any caſe in which the honour or intereſt of the nation appears to be concerned, they generally unite in the common cauſe. Before they invade any country, the general is at great pains to inform himſelf of the nature and ſituation of it; and they have now made incurſions into ſo many different parts of Hindoſtan, that there are very few countries there with which they are not very well acquainted. Their great ſobriety, and the fatigue they are capable of undergoing, render them very dangerous enemies. In all their expeditions the ſoldier firſt provides for his horſe, and then goes to his own meal; after which he lies down contented by the ſide of the animal, and is ready to mount him at the firſt ſound of the *nagar* or great drum. They have their horſes under the moſt excellent management; and by perpetually careſſing and converſing with them, the animals acquire a degree of docility and ſagacity unknown in other countries. When on an expedition, the horſes are accuſtomed to eat graſs pulled up by the roots, which is ſaid to be very nutritive, and to be deſtitute of that purgative quality which belongs to the blade alone. When they make an invaſion, the devaſtation is terrible; the cattle are driven off, the harveſt deſtroyed, the villages burned, and every human creature deſtroyed who comes in their way. Notwithſtanding this barbarity in time of war, however, they are very humane in time of peace, living in great harmony among themſelves, and being always ready to entertain and aſſiſt ſtrangers. Many of the cruelties they commit may be juſtly reckoned the effects of retaliation for other cruelties exerciſed upon them by their adverſaries. Thus, in 1771, after having given Hyder Ally a great defeat, they cut off the ears and noſes of a whole regiment of priſoners, and in that condition ſent them back to their commander, in return for his having done the ſame to a few priſoners he had taken ſome time before.

The revenue of the Paiſhwa is very conſiderable; being not leſs than ten millions ſterling; but after deducting the expence of collection, and the expence of troops kept in readineſs for the ſervice of the ſtate, it is ſuppoſed that he cannot receive more than four millions. From this again we muſt deduct the expences of the troops immediately belonging to the Paiſhwa himſelf, and which may amount to about three millions ſterling; ſo that there remains a ſurplus only of one million after paying all the neceſſary expences of government. This nevertheleſs has been managed with ſuch economy, that though long and expenſive wars were carried on after the death of Narrain Row, the ſtate was not only clear of debt, but there was a ſurplus of two millions in the treaſury, which Rogobah diſſipated.

9. The *Deccan*, as left in 1748 by Nizam al Mulek, was by far the moſt important and extenſive ſoubadary or viceroyſhip in the empire. It then ſurpaſſed in ſize the largeſt kingdom in Europe; but ſince that time many provinces have been conquered by the Mahrattas, and the northern Circars by the Britiſh. The poſſeſſions of the Nizam are alſo diminiſhed by the ceſſion of the Carnatic to the nabob of Arcot; great part of the territories of Tippoo Saib; and many other provinces of leſs note. Still, however, the Nizam poſſeſſes very conſiderable territories; but his finances are in ſuch a wretched condition, and his provinces ſo ill governed, that he is accounted a prince of no conſequence, though otherwiſe he might be reckoned one of the moſt conſiderable powers of Hindoſtan.

10. The dominions of Tippoo Saib, the ſon and ſucceſſor of Hyder Ally, are bounded on the north by the territories of the Paiſhwa; on the ſouth by Travancore, the territory of an independent Hindoo prince; on the weſt by the ſea; and on the eaſt by a great ridge of mountains, which ſeparate them from the territories of the nabob of Arcot. The country lying to the eaſtward of theſe mountains is called the Carnatic *Payen Ghat*, and to the weſtward the Carnatic *Bhalla Ghat*. The latter belongs to Tippoo Saib; and the two together make up the country formerly named the *Carnatic*, though the name is now reſtricted to the *Payen Ghat*. —The ſituation of the Bhalla Ghat is conſiderably more elevated than the other; by which means the temperature of the air is much cooler. On the coaſt

Hindostan. coast of Coromandel there is a pile of ruins called by the natives *Malavipatam*, and by the British *the seven pagodas*. Concerning this there is a tradition, that it once stood at a considerable distance from the sea, though most of the ruins are now covered with water; and there is likewise a tradition, that the mountains we speak of once formed the boundary of the ocean. The revenue and strength of Hyder Ally are said to have been greatly exaggerated: the former amounting to no more than four millions annually, though by his economy and good management he made it answer every purpose both in time of war and peace. He was at great pains to introduce the European discipline among his troops; but notwithstanding all his endeavours, he was far from being able to make them cope with the British. The advantages he gained were owing to his vast superiority in cavalry, and the celerity of his marches; which would have been counteracted had his adversaries been possessed of a good body of cavalry; and it is probable that the event of the war would have been decided in a single campaign. His son Tippoo Saib is said to have been a man of less abilities than his father, though more violent in his disposition. Against this prince hostilities commenced by the British in conjunction with the Mahrattas, between whom an alliance had been formed. Tippoo Saib himself fell a victim to his own misguided bravery at the siege of Seringapatam, which surrendered to the British on the 4th of May 1799.

22
Government of Hindostan.

With regard to the present government of Hindostan, our limits will not allow us to enter particularly upon it, nor indeed is it perhaps of any importance, as the country is divided into so many different kingdoms, the sovereigns of which, however they may differ in other respects, seem all to agree in despotism and oppression of their subjects. As a very considerable part is now under the dominion of Britain, it may be necessary to take some notice of the behaviour of our countrymen in that part of the world, especially as an idea of their excessive despotism and oppression of the natives has of late prevailed so much, that the national character has suffered considerably by it. This has arisen partly from the great pains taken to propagate it, and partly from the ignorance of those among whom the report was circulated; and the exaggerated accounts and contentions of the members of the government themselves, have contributed no less to confirm and heighten the prejudices of the public.

23
Defence of the British government in the east.

The British territories in the East Indies were originally under the jurisdiction of a governor and 13 members; but this number has fluctuated occasionally from 14 to 4, at which it was fixed by act of parliament. In this council all matters, whether relating to peace or war, government or commerce, were debated, the governor having no other superiority than that of giving the casting vote. In other respects the whole executive power was lodged in his hands, and all the correspondence with the native princes of India was carried on by his means, the dispatches to them being signed by him singly; and all the princes and great men who visited the presidency were first received by him, and then introduced to the counsellors. He was military governor of Fort William, and commander in chief of the presidency; whence, as by his office he was invested with a considerable degree of power, he became an object of some envy and jealousy to the members of the council and other considerable people in that part of the world. In consequence of this, the government was divided into two parties, one siding with the governor, and the other opposing him; in consequence of which, the debates were frequently carried on with such heat and violence, that the records of the company are frequently stuffed with nothing but accounts of the contentions of these jarring parties. This indeed may be looked upon as one of the principal causes by which the reputation of the British government in the eastern parts of the world has suffered; for as there were very frequently opinions diametrically opposite to one another recorded upon the same subject, the contending parties in the British parliament had always sufficient authority for what they said, let them take which side they would: and thus the characters of all concerned in the East India government were, by one person or other, set forth in the most opprobrious light.

Another source of reproach to the British government in India was, that the court of directors in England became infested with the same spirit of party and contention which pervaded all other departments of the state. Lord Clive and Mr Sullivan were the two great leaders in these party disputes; and as the interest of the one or the other prevailed, different persons were appointed to the administration, and different measures adopted. The event of all this was, that whenever a new administration was formed, the first object was to condemn the measures of those who had gone before him. Thus, in the year 1764, when Lord Clive was made governor of Bengal, the new directors represented the affairs of the company as in the worst situation imaginable, from which they could only be extricated by the ablities of Clive. On the arrival of the latter in the east, he took care to write home reports to the same purpose, and to condemn in the most violent manner every thing that had been done; the whole body of the company's servants were censured indiscriminately without being allowed any means of defence, as they were in truth ignorant of the charges brought against them. When the affairs of the company were brought under a parliamentary review in the year 1774, the government was brought under a new regulation. It now consisted of a governor-general and four counsellors; three of whom were sent from England; two being military gentlemen of high rank, and the third a gentleman employed in the war-office. On their arrival they proceeded in the same manner that Lord Clive had done before them: they pronounced in the most decisive manner, that the company's affairs were in a ruinous state; and that every species of corruption had been practised by the former government. This general accusation, unsupported by any kind of evidence, was the constant theme of the dispatches sent by them to England; and thus has the reputation of the British government suffered exceedingly through the unwarrantable liberties which its own servants have been allowed to take with one another. It must also be considered, that from the remote situation of India, and the unavoidable ignorance of its affairs on that account, it was easy for any person, whose malicious purposes it might suit, to prejudice the public against the servants of the company

company to as great a degree as he pleafed. Hence fome perfons, foured by difappointment, or envious of the fuppofed emoluments of others, reprefented matters in fuch an unfair light to their correfpondents in England, that the moft unjuft and fhameful charges were frequently brought againft innocent perfons, which they could neither prevent nor defend themfelves againft. The dreadful famine which took place in Bengal in the year 1769, offered to thefe malevolent perfons a moft fruitful fource of calamity; and many individuals were accufed of having brought on this dreadful calamity, which arofe entirely from a natural caufe, viz. the failure of the rains, and which no human power could have prevented or removed.

Opinions of this kind have not only been circulated through the ifland of Britain in the moft open manner, but have even appeared in fome very refpectable publications. Thus, in Dr Smith's Treatife on the Wealth of Nations, when fpeaking of the oppreffion arifing from monopolies, and comparing their effects in different ftates: "The Englifh company (fays he), have not yet had time to eftablifh in Bengal fo perfectly deftructive a fyftem. The plan of the government, however, has had exactly the fame tendency. It has not been uncommon, I am well affured, for the chief, that is, the firft clerk of a factory, to order a peafant to plow up a rich field of poppies, and fow it with rice or fome other grain. The pretence was to prevent a fcarcity of provifions; but the real reafon, to give the chief an opportunity of felling at a better price a large quantity of opium he had on hand. Upon other occafions the order has been reverfed, and a rich field of rice or other grain has been plowed up to make room for a plantation of poppies, when the chief faw that extraordinary profit was to be made by opium." To this, however, the following anfwer has appeared in a late publication, entitled A fhort Review of the Britifh government in India. "The poppy is a plant which requires a peculiar foil, and particular care in the culture of it. The medium price of the land on which it is cultivated is about 11 or 12 rupees a *begah*, or one-third of an Englifh acre. It is fowed at the beginning of October, when the feafon of the periodical rain expires. The plant begins to be fit for incifion, in order to extract its juice, of which opium is made, about the end of December, and continues fo till March. It requires a dry foil, and can be brought to maturity only in the dry feafon, when the periodical rains have ceafed. Paddy or rice lands let on a medium at three rupees a begah. Rice is fowed about the end of May, juft before the periodical rains commence. One crop is raifed about the end of September; and another, which is the laft, and by far the greateft, about the end of December. It requires a foil faturated with water, and lies foaked in it for a confiderable time. On this account it is fowed juft before the periodical rains commence; and nine-tenths of the quantity of rice produced in the company's provinces grow in the kingdom of Bengal, which is fo low and flat, that the grounds are either overflowed by the rivers Ganges and Burrampooter, with their tributary ftreams, or foaked with the rain which falls and ftagnates upon them. It is therefore evident, that the foil and the feafon, which alone can fructify the paddy or rice, would rot and deftroy the poppy; and it is therefore as evident, that it is utterly impoffible, from the nature of the two plants, that the one can be plowed up to fow the other."

With regard to the adminiftration of the Britifh affairs in the Eaft Indies, it muft alfo be remarked, that the company now act in a very different capacity from what they originally did. From a fociety of merchants, they are now become fovereigns of the country to which they trade. The latter character was quite foreign to them; and they have accordingly looked upon that of merchants to be the principal one, while that of fovereigns was to be only a kind of appendage to it. Thus, inftead of acting for the intereft of the country they govern, and which as fovereigns they naturally ought to do, they have acted in many cafes directly oppofite to it, which, as merchants, is alfo their natural intereft. Hence alfo, when the adminiftration in India did any thing in obedience to the orders of the directors, which orders being dictated by merchants, were prejudicial to the interefts of the country, that injury has been fometimes unjuftly attributed to their fervants, who acted merely in obedience to the orders they received. On the other hand, when the India adminiftration acted with the generous fpirit of fovereigns, they were fometimes blamed by the directors, who judged as merchants, and fometimes by the miniftry, who were always ready upon the fmalleft pretence to interfere in their affairs.

At the time when the Britifh adminiftration firft commenced in Hindoftan, the Hindoo governors were univerfally named *rajahs;* but though many of the Hindoo families yet bear that title, it does not appear to refemble, in any manner of way, our titles of nobility, or to be a dignity which can be conferred by any of the princes, or even by the Mogul himfelf. Hence, in that part of the world there are no ancient nobility, the titles being conferred merely by ufurpers, who have neither right nor title derived from any thing but violence.

In this country we find the title of *zemindar* very common; a word compounded of two others, fignifying, in the Perfic language, a *landholder*. It appears to have been introduced by the Mohammedans, and to have been a kind of temporary office, prefcribing the performance of certain duties, and requiring fecurity for the perfonal appearance of the zemindar. He is obliged to attend the exchequer of the king's chief collector, at the commencement of every new year, to fettle his revenues; and he is not allowed to enter upon the duties of his office for the year without a fpecial order for that purpofe. On the death of a zemindar, the candidate for fucceffion muft petition the fovereign, engaging himfelf to perform all the ftipulated duties, and to pay the cuftomary fees; nor can he enter upon his office without a fpecial inveftiture. As the zemindars were by virtue of their office invefted with confiderable power, they foon became not only very defpotic in their own dominions, but by degrees began to encroach on the power of the fovereign himfelf. After the irruption of Nadir Shah every thing was thrown into confufion: the viceroys threw off obedience to the emperor, the nabobs threw off all obedience to them, and ufurped their power; at which time it is probable that the zemindars likewife affumed powers to which they were by no means intitled

titled from their office. Notwithftanding this, however, they were fometimes treated by the Mohammedan governors as mere revenue-officers, and ufed very harfhly. At fome times there were a fet of people bound for the zemindars under the title of *woodedars;* and thefe had either a joint power with the former, or were fuperior to them in the collection of the revenues; and fometimes they were fuperfeded by officers appointed immediately by government itfelf, under the various names of *aumils*, *tahfilders*, or *fezawruls*. —The zemindaries are not limited in extent or value; there being fome in Bengal which yield a revenue as high as 350,000l. fterling, while others fcarcely amount to 350l.; but all the great zemindars, and many of thefe in middling circumftances, having procured for themfelves the title of *rajah*, affect much pomp and ftate in their different diftricts, and keep their inferiors in as great fubjection as the Mohammedan governors keep them. Some of them alfo have their power augmented by being of the Bramin caft; and by the reverence fuppofed to be due to religion on that account, joined with the power conferred upon them by the fovereign, they are in general rendered exceedingly defpotic, with an almoft unlimited authority to plunder their tenants; in which they were indulged by the nabobs, from the motive of plundering them again. From the confultations of the felect committee in 1769, we are informed that the zemindars have a power of levying fines at pleafure; that they raife large fums from duties collected in the market; and that they frequently oblige the ryots or hufbandmen to work for nothing. In fhort, the fame claims made by the European barons on their vaffals in the times of the feudal fyftem, are now made by the zemindars on the common people of Hindoftan. If one of them is to be married, if he has a child born, if honours are to be conferred upon him; nay, if he is even to be fined for his own mifconduct, the poor ryot muft always contribute his fhare. Mr Scrofton, in his hiftory of Hindoftan, fets forth the fituation of the inhabitants in the following words:—"Unhappily for the Gentoos, themfelves are made the minifters of oppreffion over each other; the Moor-men, haughty, lazy, and voluptuous, make them, of whom they have no jealoufy, the minifters of their oppreffion, which further anfwers the end of dividing them, and prevents their uniting to fling off the yoke; and by the ftrange intoxication of power, they are found ftill more rapacious and cruel than their foreign mafters: and what is more extraordinary, the Bramins ftill exceed the reft in every abufe of power, and feem to think, if they bribe God by beftowing a part of their plunder on cows and faquirs, their iniquities will be pardoned."

From this account of the fituation of the people of Hindoftan under their native rulers, it is by no means probable that they could make a worfe exchange by falling under the jurifdiction either of the Mohammedans or Europeans. A notion indeed hath been induftrioufly propagated, that the Britifh government has behaved with the greateft cruelty in collecting the revenues, and that they have even invented tortures to make the rich people difcover their treafures; but on examining the matter impartially, the reverfe of this is found to be true. At the time that the Britifh government interfered in the affairs of Hindoftan, the provinces were found to be in a ruinous ftate, in confequence of the wars which had taken place in the country. Even in the moft fettled ftate, and when the adminiftration was moft regular, the government was altogether defpotic, and the mode of collecting its revenues extremely arbitrary; the punifhments inflicted very cruel; and the whole fyftem of government fuch as would be reckoned quite fhocking in Europe. It is only within thefe few years that the Britifh could effectually interpofe in behalf of the natives; and in that fhort time it has produced a very confiderable reformation. It is certain, that the Britifh government has difcouraged oppreffive meafures as much as poffible; abolifhed the cruel modes of punifhment ufed by the Mohammedans; and by inftituting a more regular plan of juftice, has procured eafe and fecurity to the natives, and preferved them in a ftate of tranquillity altogether unknown to them before its commencement. Many inftances of the greateft cruelty exercifed upon the zemindars and other collectors are to be met with in the hiftory of Bengal, written by a native hiftorian, and tranflated by Gladwin: yet the perfon who exercifed thefe cruelties was dignified with the titles of the *faithful fervant of the Empire*, and the *Glory of the State;* which fhows that the people were abfolutely familiarifed with cruelty, and did not know what it was to be under a lenient government. Since the Britifh had the dominion, matters have been totally reverfed, and the Hindoos, inftead of being treated with cruelty, perfecuted on account of their religion, and compelled to renounce it, have been ufed with at leaft *comparative* lenity, and great indulgence has been fhown to them even in their moft abfurd practices and fuperftitions. When the Britifh government firft accepted of the office of dewanny, or collector of the revenues, it was not in their power to interpofe with any kind of efficacy for the relief of the inhabitants; becaufe it was at firft thought proper to allow the taxes to be collected by natives, who would undoubtedly follow their ancient modes of collection. Even at that time, however, the mildnefs of the Britifh governors had fome effect upon the Afiatics; fo that the people in general were treated with more lenity than formerly: and in the year 1772, when the council of Bengal openly affumed the office of dewan themfelves, an immediate ftop was put to all thofe arbitrary and oppreffive methods which had been formerly in ufe. Formerly fome zemindars had been flogged even to death, by an inftrument called a *korah:* but from the moment that the Britifh council took the collection into their own hands, not only this inftrument was laid afide, but all kind of corporal punifhment; by which means the feverity of the Mohammedan government has been entirely abolifhed, and no other punifhments inflicted in cafes of infolvency than fuch as are in ufe in our own country. Still, however, in fuch extenfive dominions, where a great fhare of power muft be one way or other committed to the natives, it is impoffible but fome arbitrary acts muft be committed, as the natives are always prone to acts of defpotifm whenever they can commit them with impunity; but examples of this kind cannot with any degree of candour be brought as a general charge againft the Britifh government in India.—Mr Scrofton gives the following account of the wretched ftate of the

the provinces now under the Britiſh juriſdiction at the time they were ceded to them by the Mogul. "When the governors of the provinces found the weakneſs of the Mogul, and each ſet up as ſovereign in his own province, although they could not break through theſe immutable laws, they invented new taxes under new names, which doubled or trebled the value of the original ones, and which the landholder was obliged to levy upon his tenants. The old ſtock of wealth for ſome time ſupported this; but when that failed, and the tenants were ſtill preſſed for more, they borrowed money of uſurers at an exorbitant intereſt; and the government ſtill continuing theſe demands, the lords of the lands were obliged to do the ſame: but as all this while the value of lands did not increaſe, the conſequence was, that at laſt, unable to pay the intereſt of the mortgages, the rents were ſeized by rapacious uſurers. The government finding the revenues fall ſhorter every year, at laſt ſent collectors and farmers of the revenues into the provinces. Thus the lord of the land was diveſted of power over his country, and the tenants expoſed to merciless plunderers; till the farmer and manufacturer, finding that the more they laboured the more they paid, the manufacturer would work no more, and the farmer would cultivate no more than was juſt ſufficient for the ſubſiſtence of his family. Thus this once flouriſhing and plentiful country has, in the courſe of a few years, been reduced to ſuch miſery, that many thouſands are continually periſhing through want. The crown lands are ſtill worſe off, let out to the higheſt bidder; and the Jagheer lands alone remain unplundered. Hence that equal diſtribution of wealth that makes the happineſs of a people, and ſpreads a face of cheerfulneſs and plenty through all ranks, has now ceaſed; and the riches of the country are ſettled partly in the hands of a few uſurers and greedy courtiers, and the reſt is carried out of the country by the foreign troops taken into pay to maintain the governors in their uſurpations. This unhappy decay the India company has already experienced in the decay of their trade, and the riſe and price of their manufactures; and will, I fear, experience more and more annually."

With regard to the depoſitions of the nabobs by the Britiſh, which has been uſed as a great argument againſt the general ſpirit of Britiſh government in thoſe parts, it muſt be remembered, in the firſt place, that theſe nabobs were mere uſurpers, who had not the leaſt title to their dominions, and conſequently could not, in point of right, complain more reaſonably of being deprived of their dominions, than the perſons from whom they had taken them might do of their injuſtice in driving them out. Their behaviour in government alſo was ſuch, that it was impoſſible it could have ſubſiſted for any length of time without the abſolute ruin of the countries they poſſeſſed. Thus, in the caſe of Jaffier Aly Cawn, Mr Vanſittart declared the country to be in ſo confuſed and impoveriſhed a ſtate, that in all human appearance another month could not have been run through before he would have been cut off by his own ſeapoys for want of pay, and the city become a ſcene of plunder and diſorder. On this account he was degraded, though without any of thoſe circumſtances of cruelty which generally characteriſe the revolutions in this part of the world. The adminiſtration was transferred to his ſon-in-law Meer Coſſim; who being an enemy to the Britiſh government altogether, a war followed, terminating in his expulſion. This was followed by the invaſion of Sujah Dowlah, and by ſcenes of horrid barbarity and devaſtation; when in 1765 Lord Clive took upon him the office of dewan, or miniſter who ſuperintends the lands and collections of the revenue. An account of his proceedings has already been given; but whatever applauſe he might gain, and in ſome reſpects deſervedly at the time, it is now ſaid with ſome probability, that he raiſed the expectations of the people of England by far too high. The ſeeds of the ſucceeding evils were already ſown. Many ſources of wealth were dried up. Raw ſilk, cloths, and other manufactures, had formerly been exported to Guzerat, Lahore, and even Iſpahan. This had ceaſed on the invaſion of Nadir Shah; and the influx of wealth from the European nations had ceaſed before the Britiſh government in Bengal had an exiſtence. It was computed that Coſſim Aly Cawn robbed the country of near five millions ſterling in jewels and ſpecie. China, Madras, and Bombay, were ſupplied from Bengal to the amount of more than two millions; and ſeveral other circumſtances beſides theſe contributed to diminiſh the riches and opulence of the country. In the mean time the internal adminiſtration of the country had been extremely defective. The zemindars being under very little reſtraint, acted in a very arbitrary manner within their own diſtricts; and the tenants had no redreſs againſt the impoſitions and exactions which were laid upon them. Meer Coſſim appointed *aumils* to the collection of the revenues rather than zemindars. The aumils derive their authority directly from the perſon who has the command of the country for the preſent time, and conſequently are more eaſily called to an account than the zemindars. At laſt, however, theſe aumils, having obtained too great an influence in the country, Lord Clive thought proper to change the plan of collection. Three natives were now appointed, in the nabob's name, to ſuperintend this department; and one Engliſh gentleman, through whom the buſineſs was tranſacted, had his reſidence at the nabob's court, and communicated the intelligence to Calcutta. The principal acting miniſter in this plan, however, thought proper to change the mode of collection once more, and to re-appoint the aumils; in conſequence of which the revenue became greatly diminiſhed, and they were beſides complained of as greatly oppreſſing the people. To remedy theſe evils, it was firſt propoſed by Mr Verelſt, to ſend ſome of the company's ſervants into the internal parts of the country with the title of ſupervisors: but the defects of adminiſtration were now beyond their power to remedy; the revenue was not only greatly diminiſhed, but the expence of government exceedingly augmented; and in the year 1771 the company were alarmed by accounts that bills had been drawn upon them to the amount of 1,200,000l. At this time Mr Haſtings was appointed to be governor of Bengal; and the confuſed ſtate in which matters were at the commencement of his adminiſtration will eaſily appear from the following extract of a letter from the government of Bengal, dated in the month of November 1772.—"Every zemindary was left to its own particular cuſtoms. The articles which

which compoſed the revenue, the form of keeping the accounts, the computation of time, even the technical terms, which ever form the greateſt obſcurity in every ſcience, differed as much as the ſoil and productions of the province. The nabobs exacted what they could from the zemindars and great farmers of the revenue, whom they left at liberty to plunder all below, reſerving to themſelves the liberty of plundering them in their turn, when they were ſuppoſed to have enriched themſelves with the ſpoils of the country. The muſaddies, who ſtood between the nabob and zemindars, and between them and the people, had each their ſhares of the public wealth. Theſe profits were conſidered as illegal embezzlements, and therefore were taken with every precaution which could enſure ſecrecy; and being, conſequently, fixed by no rule, depended on the temper, abilities, or power, of each individual for the amount. It therefore became a duty to every man to take the moſt effectual meaſures to conceal the value of his property, and evade every inquiry into his conduct; while the zemindars and other landholders, who had the advantage of long poſſeſſion, availed themſelves of it by complex diviſions of the lands, and intricate modes of collection, to perplex the officers of government, and confine the knowledge of the rents to themſelves. The internal management of each diſtrict varied no leſs than that of the whole province. The lands ſubject to the ſame collection, and intermixed with each other, were ſome held by farm, ſome ſuperintended by ſhickdors or agents on the part of the collector, and were left to the zemindars themſelves, under various degrees of controul." For ſome political reaſons the company, though they had acquired the dewanny, had not yet choſen to aſſume the executive part of the office themſelves, but committed it to the management of natives, as has already been mentioned, and their plans had been found extremely defective. By the time that Mr Haſtings had been inveſted with the government, the court of directors had reſolved to change their plan, and openly aſſume the office of the dewanny; and the rules eſtabliſhed by that gentleman for the collection of the revenues, his mode of adminiſtering juſtice, and his police for the government of the country, are ſtill obſerved with very little variation.

The plan for collecting the revenues conſiſted, in the firſt place, in rendering the accounts as ſimple and intelligible as poſſible; in the next, in eſtabliſhing fixed rules for the collection; and in the third, making the mode of them uniform in all parts of the provinces; and in the fourth, providing for the equal adminiſtration of juſtice. The power of the zemindars was now circumſcribed, and their extortions thoroughly put a ſtop to; many vexatious taxes and tolls were aboliſhed, and a new mode of collecting the cuſtoms was eſtabliſhed, to the great relief of the merchants: and ſo well were all the parts of this plan found to be adapted to the purpoſes they were deſigned to anſwer, that it has hitherto been made the model of all ſubſequent regulations.

One great objection to the India government is, that the Engliſh law, which undoubtedly is better calculated than any other for ſecuring the liberties of the people, has not yet been adopted in India; whence it is thought that the company's ſervants have ſtill ſhowed a diſpoſition to oppreſs, rather than to relieve, the oppreſſed inhabitants of Hindoſtan. But in anſwer to that it is ſaid, that the difference betwixt the two countries is ſo great, that there can be no compariſon betwixt the one and the other, nor can the conſtitution of England be in any degree adapted to that of the other. The religion, laws, manners, and cuſtoms, of both Hindoos and Mohammedans, are ſo eſſentially different from thoſe of this country, that it is impoſſible to aſſimilate them, ſhould ever any thing of the kind be attempted. The only true method therefore of judging whether the preſent ſtate of Hindoſtan is preferable to what it formerly was, is to compare it with what it was under the beſt Mogul emperors; and in this compariſon it muſt certainly appear that the preference is greatly in favour of the Britiſh adminiſtration. In Major Rennel's work we are informed, that during the reign of Ackbar, whom he ſtyles "the glory of the houſe of Timur," the country had never enjoyed ſo much tranquillity; "but this tranquillity would hardly be deemed ſuch in any other quarter of the world, and muſt therefore be underſtood to mean a ſtate ſhort of actual rebellion, or at leaſt commotion." The ſame author, ſpeaking of the ſtate of the Britiſh empire there, uſes the following words: "The Bengal provinces which have been in our actual poſſeſſion near 23 years, have, during that whole period, enjoyed a greater ſhare of tranquillity than any other part of India, or indeed than thoſe provinces had ever experienced ſince the days of Aureng-zebe." To this we may add, that the provinces have not only experienced a perfect freedom from external invaſions, but likewiſe enjoy a degree of internal tranquillity altogether unknown before, by the ſubjection and civilization of a ſet of banditti who inhabited the hills of Rajemahl, and infeſted the travellers who paſſed that way; a wandering tribe of religious mendicants, who were wont to commit the greateſt enormities.

Another advantage which the inhabitants of this country reap from the Britiſh government, is the ſecurity from violence and oppreſſion either by their Mohammedan ſuperiors or by one another. Under the article HINDOO we have already mentioned the particular circumſtances that theſe people are liable to the puniſhment of loſing their caſt from a variety of cauſes, and that this is looked upon by them to be the moſt grievous calamity they can ſuffer. The Mohammedan governors frequently took advantage of their ſuperſtition in this reſpect to oppreſs them; and this circumſtance alone frequently produced the moſt horrid confuſion. In the inſtructions given to the ſuperviſors, Mr Verelſt informs them, that "it is difficult to determine whether the original cuſtoms, or the degenerate manners of the Muſſulmans, have moſt contributed to confound the principles of right and wrong of theſe provinces. Certain it is (adds he), that almoſt every deciſion of theirs is a corrupt bargain with the higheſt bidder. Compenſation was frequently accepted of even for capital crimes, and fines became at laſt an intolerable grievance; nay ſo venal were the judges at that time, that it became at laſt a ſettled rule to allow each of them a fourth part of any property in diſpute as a compenſation for his trouble.—It is impoſſible to ſuppoſe that ſuch monſtrous abuſes continue under the Britiſh government: on the contrary we muſt readily believe,

believe, what the governors themſelves aſſert, that immediately after the provinces fell under Britiſh juriſdiction, both Hindoos and Mohammedans have been left to the free exerciſe of their religion, laws, and cuſtoms. The Hindoos themſelves acknowledge this, and are as well pleaſed with the mildneſs of the Britiſh government, as they are diſpleaſed with the ſuperſtition and cruelty of the Mohammedans. Under the Britiſh government we cannot ſuppoſe but that commerce, to which the inhabitants of this country are ſo much addicted, will be much more encouraged than by the avaricious and barbarous Mohammedans. The latter had impoſed ſo many reſtraints upon trade of all kinds, by the multitude of taxes collected at the landing-places, watch-houſes, markets, &c. that it was almoſt impoſſible to carry it on with any advantage. Among other ſalutary regulations, however, enacted by the Britiſh government in 1772, many of thoſe taxes upon commerce were aboliſhed, and a plan laid for effectually liberating the inhabitants from thoſe ſhackles by which their commerce had been ſo long fettered.—Regard has alſo been paid to the inſtruction of the people in uſeful knowledge; and the ſeminary eſtabliſhed at Calcutta by Sir William Jones, certainly does much honour to the founder. Some regard had indeed been paid to this by the Mohammedan emperors; but at the time that the Britiſh government commenced, theſe had been entirely neglected, their endowments reſumed by government, and even the buildings fallen into ruin.

From a compariſon of any government to which the Hindoos have hitherto been ſubject, with that of Britain, indeed, it is evident that the preference muſt be given greatly in favour of the latter. At the time when the Britiſh firſt viſited that country, they were not under the juriſdiction of their native ſovereigns, nor had they been ſo for a long time before. The Moguls were not only foreigners, but a moſt cruel and deteſtable race of men; and it was by uſurpations of their own rebellious ſubjects that the anarchy and confuſion was introduced, in which the country was involved for ſo long a time. The Britiſh are foreigners as well as the Moguls; but the latter, who profeſs the intolerant ſuperſtition of Mohammed, ſuffer their conduct to be influenced by it in ſuch a manner as to treat the natives with the utmoſt cruelty. The greateſt evil perhaps which reſults from the Britiſh government is, the exportation of great ſums of money to a foreign country; but this evil, with reſpect to the provinces poſſeſſed by the Britiſh, exiſted alſo under the Mohammedan government. The Mogul emperors reſided at Delhi, which is far diſtant from the provinces of Bengal, Bahar, and Oriſſa, the territories now poſſeſſed by Britain; ſo that the greateſt part of the treaſure ſent to that capital was totally loſt to them. In the time of Aureng-zebe, the emperor's tribute amounted to three millions ſterling; and of this a conſiderable part was ſpecie; but ſince that time the tribute was fixed at only 1,250,000l. and even this was a vaſt ſum; to which if we add that carried out of the country by commanders of mercenary troops, who were all foreigners, it is not unreaſonable to ſuppoſe that under the Mogul government matters were ſtill worſe, even in this reſpect, than under that of Britain.

We ſhall conclude this apology for the Britiſh government, with the following extract from the treatiſe lately quoted, A ſhort Review of the Britiſh Government in India. "A more deteſtable or deteſted race of people never appeared than the Mohammedan conquerors of India; whether we conſider the brutality of their paſſions, the bigotry of their religion, the corruption of their manners, the barbarity of their education, or the tyranny of their government: In all theſe reſpects they were the terror and abhorrence of the Hindoos, whoſe country they invaded, and whoſe dominion they uſurped.

"The fanatic ignorance of the ſavage caliph, which dictated his barbarous reaſon for deſtroying the Alexandrian library, had neither been tutored nor refined by the Tartar education of Timur and his predeceſſors. The ſame ſuperſtitious bigotry which incited the Arabian caliphs to deſtroy the monuments of weſtern learning, likewiſe impelled the Tartar khans to overthrow the religious temples of the eaſtern worſhip. At the commencement of the 11th century Mahmood entered Hindoſtan, and in the courſe of 12 expeditions he deſtroyed the famous temples of Nagracut, Tannaſar, Matra, and Sumnaut. In the latter end of the next century, Mahmood Gori penetrated as far as the city of Benares, and committed outrages as Mahmood had done before at Nagracut and Sumnaut. Tamerlane poſſeſſed as much of this furious zeal as any of his ſavage predeceſſors; and if the enthuſiaſm of this deſtructive religion had not occaſionally abated among ſome of his ſucceſſors, they would ſcarce have left a Hindoo temple or prieſt in the country they ſubdued.

"Enough, however, had been done to fix an indelible ſtain on the memory of thoſe intolerant tyrants, and to make a laſting impreſſion on the minds of the Hindoos, who, to the lateſt period of the Mogul government, were kept in conſtant dread of doctrines, which, to their apprehenſions, ſeemed to inſpire the Mohammedans with ſacrilegious cruelty. Idolatry is as great an abomination to a Muſſulman as it was to the Jews when they moſt ſtrictly revered the divine command which prohibits it; and moſt of the Hindoo ceremonies being conſidered by the Mohammedans as acts of idolatry, and all their pagodas as temples of idols, a religious principle excited mutual ſentiments of abhorrence and antipathy between the conquerors and their ſubjects. The reſt of the character of the Mohammedans may be ſummed up in the conciſe and emphatic words of Mr Scrafton, who ſays, 'their diſtinguiſhing qualities are perfidy and ſenſuality.'

"But notwithſtanding theſe facts, and that the hiſtory of their government is a diſguſting repetition of oppreſſion, maſſacres, and rebellion, the faſhion of the times has been to praiſe it, and to repreſent the ſituation of the Hindoos as eaſy and happy under it, till they were diſturbed in this peaceful ſtate of repoſe and ſecurity by the Engliſh; who have been deſcribed (with unparalleled injuſtice) as a ſet of rapacious taſkmaſters. It ſurely requires a very ſmall degree of reflection to perceive, that ſuch repreſentations of the two governments muſt, from the very nature of things, be falſe.

"The Mohammedan conquerors came into India from a barbarous region, with minds and manners as uncultivated as the wilds from which they iſſued. The only notion they had of government was abſolute power in in the fovereign, and abfolute fubmiffion in the fubject. The tenets of their religion, fo far from foftening the ferocity of their nature, ferved only to whet the edge of their perfecution towards the fuffering Hindoos, whom they haraffed without mercy, and deftroyed without remorfe. The Britifh conquerors came from a country famed for arts and fciences; the generous principles of public liberty had been inftilled into their minds from their earlieft infancy: the mild tenets of Chriftianity cherifhed and commanded every charitable duty: and they had been taught, by precept and example, to rule with equity, and to obey with freedom. Can it be fuppofed that under thefe circumftances, the two nations fhould have totally changed characters on their coming into India? That the barbarous and ferocious Tartar fhould become mild and enlightened; that the cultivated and generous Briton fhould have degenerated into a cruel tyrant; and that the Britifh governors fhould have rendered the fituation of their Hindoo fubjects worfe than it was under the Mogul emperors? Reafon revolts at the idea; and nothing but the rankeft prejudice could ever fuggeft or adopt it."

With regard to the geography of this country, Mr Rennel obferves, that though by the modern Europeans, Hindoftan has been underftood to mean the tract fituated between the rivers Indus and Ganges on the eaft and weft, the mountains of Thibet and Tartary on the north, and the ocean on the fouth, the extent of Hindoftan, properly fo called, is much more circumfcribed; and the name ought only to be applied to that part which lies to the northward of 21° or 22° latitude. The reputed fouthern boundary of Hindoftan is the Nerbudda river as far as it goes, and the northern frontiers of Bengal and Bahar compofe the remainder. The countries to the fouth of this line are called *Deccan* by the Indian geographers, and comprehend about one half of the territory generally known by the name of the *Mogul Empire*. Our author therefore choofes to diftinguifh the northern part by the name of *Hindoftan Proper;* which has indeed the Indus and mountains of Thibet and Tartary for its weftern and northern boundaries; but the Burrampooter river is rather to be confidered as the eaftern boundary than the Ganges; the latter interfecting fome of the richeft provinces in the empire. According to this fuppofition, Hindoftan Proper will equal in fize the countries of France, Germany, Bohemia, Hungary, Switzerland, Italy, and the Low Countries; the Deccan and peninfula being about equal to the Britifh iflands, Spain, and Turkey in Europe.

Towards the north, Hindoftan is very cold and barren; but towards the fouth, very hot, and fertile in corn, rice, fruits, and other vegetables. The northern provinces are very mountainous and fandy; while the fouthern are for the moft part level, and well watered with feveral rivers.

The moft remarkable mountains are thofe which furround it on three fides. Thofe on the weft, feparating it from Perfia, called, in general, *Soleyman Kûy*, or *the mountains of Soleyman*, are of a vaft height as well as breadth, and are only paffable in certain places, through which roads have been made for the fake of commerce. The chief are thofe which lead to Cabul, Gazna, and Candahar. This great chain of mountains is inhabited by different nations, the principal of which are the Afghans, or Patans, and the Baluches, who have extended themfelves on the fide of India, as well as Perfia. The mountains on the north are called *Nagrakut*, *Hima*, or *Mûs Tâg*, which has an affinity with *Imaüs*, and by other names, which are given alfo in common to the mountains on each fide, feparating Hindoftan from Thibet. The very profpect of thefe mountains is frightful, being nothing but hideous precipices, perpetually covered with fnow, and not to be croffed without the greateft danger and difficulty.

The moft remarkable rivers of Hindoftan are the Indus and Ganges. The former is called by the orientals, *Send*, *Sind*, or *Sindi*. It rifes in the mountains to the north or north-eaft of Hindoftan; whence, after a long courfe, firft to the fouth and then to the fouthweft, it falls into the Perfian fea, below Lower Bander, by feveral mouths. In its courfe it receives feveral other large rivers, as the Nilâh, Jamal, Behat, and Lakka.

The Ganges, called in the Indies *Ganga*, rifes in the kingdom of Thibet: entering Hindoftan about the 30th degree of latitude, it runs firft fouth-eaftward by the cities of Bekâner, Minapor, Halabas, Benâres, and Patna, to Rajah Mahl, where it divides into two branches. The eaftern having paffed by Dâkka, the capital of Bengal, enters the gulf of that name about Chatigan. The weftern, defcending by Koffum-Bazar and Hughly, falls into the gulf below Chandernagor towards Pipeli.

Many of the Jews and ancient Chriftians believed this river to be the Pifon, one of the four mentioned in Scripture as the boundaries of the terreftrial paradife. The Indians retain the greateft reverence for its waters, going in crowds from the remoteft parts of the country to wafh in them, from a perfuafion that they deface from all the fpots of fin. The reafon of this is, becaufe they imagine this river does not take its fource from the bofom of the earth, but defcends from heaven into the paradife of Devendre, and from thence into Hindoftan. Nothing is more childifh than the fables of the Bramins on this fubject, yet the people fwallow them all. The Mogul and prince of Golconda drink no other water than that of the Ganges: foreigners, on the contrary, pretend that it is very unwholefome, and that it cannot be fafely drank till it is firft boiled. There is a great number of fuperb pagodas on the banks of the Ganges, which are immenfely rich. At certain feftivals, there has been fometimes a concourfe of 100,000 people who came to bathe in it. But what principally diftinguifhes this river, befides its greatnefs and rapidity, is the gold it brings down in its fands and throws on its banks; and the precious ftones and pearls it produces, not only in itfelf, but in the gulf of Bengal, into which it difcharges its waters, and which abounds therewith. The Chun or Jemma, the Guderafu, the Perfilis, Lakia, and feveral other rivers, difcharge themfelves into it during its courfe.

The weather and feafons are, for the general, very regular in this fpacious country; the winds blowing conftantly for fix months from the fouth, and fix from the north, with very little variation. The months of April, May, and the beginning of June, till the rains fall, are fo extremely hot, that the reflection from the ground is apt to blifter one's face; and but for the breeze or fmall gale of wind which blows every day, there

there would be no living in that country for people bred in northern climates; for excepting in the rainy ſeaſon, the coldeſt day is hotter there at noon than the hotteſt day in England. However, very ſurpriſing changes of heat and cold ſometimes happen within a few hours; ſo that a ſtifling hot day is ſucceeded by a night cold enough to produce a thin ice on the water, and that night by a noon as ſcorching as the preceding. Sometimes, in the dry ſeaſon, before the rains, the winds blow with ſuch extreme violence, that they carry vaſt quantities of duſt and ſand into the air, which appear black, like clouds charged with rain; but fall down in dry ſhowers, filling the eyes, ears, and noſtrils of thoſe among whom they deſcend, and penetrate every cheſt, cabinet, or cupboard, in the houſes or tents, by the key-hole or crevices.

From Surat to Agra, and beyond, it ſeldom or never rains, excepting in one ſeaſon of the year: that is, from the middle of June to the middle of September. Theſe rains generally begin and end with moſt furious ſtorms of thunder and lightning. During theſe three months it rains uſually every day, and ſometimes for a week together without intermiſſion: by this means the land is enriched, like Egypt by the Nile. Although the land looks before like the barren ſands of the Arabian deſerts; yet, in a few days after thoſe ſhowers begin to fall, the ſurface appears covered with verdure. When the rainy ſeaſon is over, the ſky becomes perfectly ſerene again, and ſcarce one cloud appears all the other nine months: however, a refreſhing dew falls every night during that dry interval, which cools the air, and cheriſhes the earth.

The produce of Hindoſtan is very rich in every kind, whether it be foſſil, vegetable, or animal. Beſides other precious ſtones found in it, there is a diamond-mine at the town of Soumelpûr in Bengal. Quarries of Theban ſtone are ſo plentiful in the Mogul's empire, that there are both moſques and pagods built entirely of it. Some travellers tell us, there are mines of lead, iron, and copper, and even ſilver; but thoſe of the laſt, if there be any, need not be opened, ſince the bullion of all nations is ſunk in this empire, which will take nothing elſe in exchange for her commodities, and prohibits the exporting it again. They till the ground with oxen and foot-ploughs, ſowing in May and the beginning of June, that all may be over before the rains, and reaping in November and December, which with them are the moſt temperate months in the year. The land is nowhere incloſed, excepting a little near towns and villages. The graſs is never mowed to make hay, but cut off the ground, either green or withered, as they have occaſion to uſe it. Wheat, rice, barley, and other grain, grow here in plenty, and are very good. The country abounds no leſs in fruits, as pomegranates, citrons, dates, grapes, almonds, and cocoa-nuts; plums, thoſe eſpecially called *mirabolans;* plantains, which in ſhape reſemble a ſlender cucumber, and in taſte excel a Norwich pear; mangos, an excellent fruit, reſembling an apricot, but larger; ananas or pine-apples; lemons and oranges, but not ſo good as in other countries; variety of pears and apples in the northern parts; and the tamarind-tree, the fruit of which is contained in a pod reſembling thoſe of beans. There are many other kinds of fruit-trees peculiar to the country. But the valuable trees are the cotton and mulberry, on account of the wealth they bring the natives from the manufactures of callicoes and ſilks. They plant abundance of ſugar-canes here, as well as tobacco; but the latter is not ſo rich and ſtrong as that of America, for want of knowing how to cure and order it.

Hindoſtan affords alſo plenty of ginger, together with carrots, potatoes, onions, garlic, and other roots known to us, beſides ſmall roots and herbs for ſallads; but their flowers, though beautiful to look at, have no ſcent, excepting roſes, and ſome few other kinds.

There is a great variety of animals in this country, both wild and tame; of the former are elephants, rhinoceroſes, lions, tygers, leopards, wolves, jackals, and the like. The jackals dig up and eat dead bodies, and make a hideous noiſe in the night. The rhinoceros is not common in the Mogul's empire; but elephants are very numerous, ſome 12, 14, or 15 feet high. There is plenty of veniſon and game of ſeveral kinds; as red-deer, fallow-deer, elks, antelopes, kids, hares, and ſuch like. None of theſe are imparked, but all in common, and may be any body's who will be at the pains to take them. Among the wild animals alſo may be reckoned the muſk-animal, apes, and monkeys.

Hindoſtan affords variety of beaſts for carriage, as camels, dromedaries, mules, aſſes, horſes, oxen, and buffaloes. Moſt of the horſes are white, and many curiouſly dappled, pied, and ſpotted all over. The fleſh of the oxen is very ſweet and tender. Being very tame, many uſe them as they do horſes to ride on. Inſtead of a bit, they put one or two ſmall ſtrings through the griſtle of the noſtrils, and faſtening the ends to a rope, uſe it inſtead of a bridle, which is held up by a bunch of griſtly fleſh which he has on the fore-part of his back. They ſaddle him as they do a horſe; and, if ſpurred a little, he will go as faſt. Theſe are generally made uſe of all over the Indies; and with them only are drawn waggons, coaches, and chariots. Some of theſe oxen will travel 15 leagues in a day. They are of two ſorts; one ſix feet high, which are rare; another called *dwarfs*, which are only three. In ſome places, where the roads are ſtony, they ſhoe their oxen when they are to travel far. The buffalo's ſkin makes excellent buff, and the female yields very good milk; but their fleſh is neither ſo palatable nor wholeſome as beef. The ſheep of Hindoſtan have large heavy tails, and their fleſh is very good, but their wool coarſe.

This country is much infeſted with reptiles and inſects; ſome of a noxious kind, as ſcorpions, ſnakes, and rats; but the lizards, which are of a green colour, are not hurtful. Snakes and ſerpents, we are told, are ſometimes employed to deſpatch criminals, eſpecially ſuch as have been guilty of ſome atrocious crime, that kind of death being attended with the moſt grievous torture. The moſt troubleſome inſects in this hot country are flies, muſketoes, and chinches or bugs, the firſt by day, and the others in the night; when they offend no leſs by their ſtench than their bite.

HINE, or Hind, a huſbandman's ſervant. Thus the perſon who overſees the reſt, is called the maſter's hine.

HINNOM, or *the Valley of* Hinnom, in *Ancient Geography*, a place that lay to the ſouth of Jeruſalem. It

It was alſo called *the valley of Tophet*, and was remarkable for the cruel and barbarous worſhip of the god Moloch, where parents made their children paſs through the fire in honour of that idol.

HINZUAN, one of the Comora iſlands, lying between Madagaſcar and the continent of Africa, otherwiſe called Anzuame, Anjuan, Juanny, and Johanna. As the accounts given of it by the abbé Raynal and Major Rooke ſeem to contradict each other, we ſhall lay before our readers the ſubſtance of Sir William Jones's deſcription of it, by whom the iſland was viſited, and whoſe regard to veracity will not be controverted.

It reſembles a vaſt amphitheatre, of which a general notion may be formed, by conceiving in the mind a multitude of hills infinitely diverſified in figure and in magnitude, thrown together with artleſs ſymmetry in all conceivable poſitions. A ſeries of mountains forms the back ground, one of which is pointed, almoſt half a mile above the level of the ſea, and not more than three miles from the ſhore. The whole of them are richly clothed with fruit trees of exquiſite verdure. Beyond this range is another tier, partly barren and partly verdant. Nearer the ſhore there is a vaſt multitude of cliffs, which bring their verdure almoſt to the water-ſide. The rows of palm trees with which it abounds, which give an enchanting beauty and variety to the ſcene, almoſt appear to have been planted by deſign.

The north ſide of the iſland ſhoots out into two points, which are 26 miles diſtant from each other, with a large bay between them. It is juſtly conſidered as a proper place of refreſhment for veſſels bound to and from the Eaſt Indies, as it yields limes, lemons, oranges, and many other valuable antiſcorbutics. The town which is the king's reſidence, is on the eaſt ſide of the iſland, which contains no more than about 200 houſes, notwithſtanding it is three-fourths of a mile in length.

The cattle of this iſland are a ſort of buffaloes, with a large hump on their ſhoulders, which is reported to be moſt delicious eating; but there are no horſes, aſſes, or mules in the iſland. The original natives may be about 7000, who occupy the hills, and carry on deſultory wars with the Arabian interlopers living on the ſea coaſt, and about 3000 in number. The expences of government are defrayed by a tax on 200 villages, but the three principal towns are exempted. The kingly power is conſidered as elective by the principles of the conſtitution; but the line of ſucceſſion has not been altered ſince the firſt election of a ſultan.

The price of every article is under proper regulations, and ſhips who touch here can be plentifully ſupplied with bullocks, goats, and fowls. The people ſeem to be extravagantly fond of titles, and therefore lords, dukes, and princes are common among them. A duke will diſpoſe, in perſon, of the product of his own eſtate, which men of a ſimilar rank in Europe will only do by the intervention of agents. The natives are ſaid to be indolent, as is the caſe in moſt tropical countries, and neglect the cultivation of that exuberant ſoil which Providence has beſtowed upon them.

There is a ſacred lake, about half a mile in circumference, in the interior part of the iſland, about fifteen miles from the town of Johanna. The wild ducks frequenting this ſequeſtered ſpot are ſaid to be worſhipped by the natives, and conſulted as oracles in all affairs of importance. Theſe people countenance polygamy, and the keeping of concubines. The men are extremely jealous, and never admit ſtrangers of their own ſex to ſee the women.

The chewing the betel nut prevails greatly in Hinzuan, as in moſt eaſtern countries, and correſponds to the European cuſtom of ſmoking tobacco or taking ſnuff, only with this difference, that the practice is ſtill more general. They are very abſtemious as to the uſe of wine, that article being prohibited by the religion of Mahomet, and perform the duty of prayer three or four times a-day. E. Long. 44. 15. S. Lat. 12. 30.

HIP, in the *Materia Medica*, the fruit of the dog-roſe, or wild brier. See Rosa, Botany *Index*.—This fruit contains a ſouriſh ſweetiſh pulp; with a rough prickly matter incloſing the ſeeds, from which the pulp ought to be carefully ſeparated before it be taken internally: the Wirtemberg college obſerves, that from a neglect of this caution, the pulp of hips ſometimes occaſions a pruritus and uneaſineſs about the anus; and the conſerve of it has been known to excite violent vomiting. The conſerve is the only officinal preparation of this fruit.

HIPPARCHUS, a great aſtronomer, born at Nice in Bithynia, flouriſhed between the 154th and 163d Olympiads. His commentary upon Aratus's Phenomena is ſtill extant. Rohault was very much miſtaken when he aſſerted, that this aſtronomer was not acquainted with the particular motion of the fixed ſtars from weſt to eaſt, by which their longitude changes. By foretelling eclipſes, he taught mankind not to be frightened at them, and that even the gods were bound by laws. Pliny, who tells this, admires him for making a review of all the ſtars; by which his deſcendants would be enabled to diſcover whether they are born and die, whether they change their place, and whether they increaſe and decreaſe.

HIPPIA, a genus of plants belonging to the ſyngeneſia claſs. See Botany *Index*.

HIPPOBOSCA, or Horse-fly, a genus of inſects, belonging to the order of diptera. See Entomology *Index*.

HIPPOCAMPUS, or Sea-horse, a ſpecies of fiſh belonging to the genus ſyngnathus. See Syngnathus, Ichthyology *Index*.

HIPPOCASTANUM, or common horſe-cheſnut. See Æsculus, Botany *Index*.—It may be here added, that from ſeveral experiments in the French *Memoires d'Agriculture*, it appears that the fruit of the horſe-cheſnut affords a wholeſome nouriſhment for cattle, and may even be employed with ſucceſs for fattening them. It is ſaid to render the tallow of thoſe fattened with it particularly firm. The milk yielded by cows fed upon it, is alſo ſaid to be thicker and richer than that produced from any other kind of food.—The fruit of this tree has been likewiſe uſed as food for ſheep and poultry, and as ſoap for waſhing. It was much employed in powder as a ſternutatory by an itinerant oculiſt, and has been recommended by ſome others in certain ſtates of ophthalmia, headach, &c. in which errhines are indicated. Its effects as a ſternutatory may alſo be obtained by uſing it under the form of infuſion or decoction drawn up into the noſtrils. And it is entirely with a view to its errhine power that it is now introduced into the pharmacopœia of the Edinburgh college.

lege. But besides this, the bark has also been represented by some as a cure for intermittent fevers; and it is probably with this intention that this part of the hippocastanum is introduced as an officinal article in the Pharmacopœia Rossica.

HIPPOCENTAUR (formed of ἱππος, "horse," κεντεω, *pungo*, "I spur," and ταυρος, "bull"), in antiquity, a fabulous monster, supposed to be half horse and half man.

What gave occasion to the fable was, that a people of Thessaly, inhabiting near Mount Pelion, became thus denominated, because they were the first that taught the art of mounting on horseback; which occasioned some of their neighbours to imagine, that the horse and man made but one animal.

The hippocentaurs should seem to have differed from the centaurs, in this, that the latter only rode on bullocks, and the former on horses, as the names themselves intimate.

HIPPOCRAS, a medicinal drink, composed of wine, with spices and other ingredients infused therein; much used among the French by way of a cordial dram after meals.

There are various kinds of hippocras, according to the kind of wine and the other additional ingredients made use of; as white hippocras, red hippocras, claret-hippocras, strawberry hippocras, hippocras without wine, cyder hippocras, &c.

That directed in the late London Dispensary, is to be made of cloves, ginger, cinnamon, and nutmegs, beat and infused in canary with sugar; to the infusion, milk, a lemon, and some slips of rosemary, are to be put, and the whole strained through a flannel. It is recommended as a cordial, and as good in paralytic and all nervous cases.

HIPPOCRATIA, a genus of plants belonging to the triandria class; and in the natural method ranking with those of which the order is doubtful. See BOTANY *Index*.

HIPPOCRATES, the greatest physician of antiquity, was born in the island of Cos in the 80th Olympiad, and flourished at the time of the Peloponnesian war. He was the first that we know of who laid down precepts concerning physic; and, if we may believe the author of his life, who goes under the name of *Soranus*, drew his original from Hercules and Æsculapius. He was first a pupil of his own father Heraclides, then of Herodicus, then of Gorgias of Leontinum the orator, and, according to some, of Democritus of Abdera. After being instructed in physic, and in the liberal arts, and losing his parents, he left his own country, and practised physic all over Greece; where he was so much admired for his skill, that he was publicly sent for with Euryphon, a man superior to him in years, to Perdiccas king of Macedonia, who was then thought to be consumptive. But Hippocrates, as soon as he arrived, pronounced the disease to be entirely mental, as in truth it was. For upon the death of his father Alexander, Perdiccas fell in love with Philas, his father's mistress: and this Hippocrates discerning by the great change her presence always wrought upon him, a cure was soon effected.

Being intreated by the people of Abdera to come and cure Democritus of a supposed madness, he went; but, upon his arrival, instead of finding Democritus mad, he found all his fellow citizens so, and Democritus the only wise man among them. He heard many lectures, and learned much philosophy from him; which has made Cornelius Celsus and some others imagine, that Hippocrates was the disciple of Democritus, though it is probable they never saw each other till this interview which was occasioned by the Abderites. Hippocrates had also public invitations to other countries. Thus, when a plague invaded the Illyrians and Pæonians, the kings of those countries begged him to come to their relief: he did not go; but learning from the messengers the course of the winds there, he concluded that the distemper would come to Athens; and foretelling what would happen, applied himself to take care of the city and the students. He was indeed such a lover of Greece, that when his fame had reached as far as Persia, and upon that account Artaxerxes had intreated him by his governor of the Hellespont, with a promise of great rewards, to come to him, he refused to go. He also delivered his own country from a war with the Athenians, that was just ready to break out, by prevailing with the Thessalians to come to their assistance, for which he received very great honours from the Coans. The Athenians also conferred great honours upon him: they admitted him next to Hercules in the Eleusinian ceremonies; gave him the freedom of the city; and voted a public maintenance for him and his family in the prytaneum or council-house at Athens, where none were maintained at the public charge, but such as had done public service to the state. He died among the Larissæans, some say in his 90th year, some in his 85th, others in his 104th, and some in his 109th. The best edition of his works is that of Foesius in Greek and Latin. Hippocrates wrote in the Ionian dialect. His aphorisms, prognostics, and all that he has written on the symptoms of diseases, justly pass for masterpieces. See *History of* MEDICINE.

HIPPOCRENE, in *Ancient Geography*, a fountain of Mount Helicon, on the borders of Bœotia, sacred to the muses. Some, as Ovid, make Hippocrene and Aganippe the same. See AGANIPPE.

HIPPOCREPIS, COMMON HORSE-SHOE VETCH, a genus of plants belonging to the diadelphia class; and in the natural method ranking under the 32d order, *Papilionaceæ*. See BOTANY *Index*.

HIPPODROME, HIPPODROMUS (composed of ἱππος "horse," and δρομος "course," of the verb δρεμω *curro*, "I run"), in antiquity, a list or course wherein chariot and horse races were performed, and horses exercised.

The Olympian hippodrome or horse-course was a space of ground of 600 paces long, surrounded with a wall, near the city Elis, and on the banks of the river Alpheus. It was uneven, and in some degree irregular, on account of the situation; in one part was a hill of a moderate height, and the circuit was adorned with temples, altars, and other embellishments. See STADIUM. There is a very famous hippodrome at Constantinople, which was begun by Alexander Severus, and finished by Constantine. This circus, called by the Turks *atmeican*, is 400 paces long, and above 100 paces wide. At the entrance of the hippodrome there is a pyramidal obelisk of granite in one piece, about 50 feet high, terminating in a point, and charged with hieroglyphics. The Greek and Latin inscriptions

tions on its base show, that it was erected by Theodosius; the machines that were employed to raise it are represented upon it in basso-relievo. We have some vestiges in England of the hippodromus, in which the ancient inhabitants of this country performed their races; the most remarkable is that near Stonehenge, which is a long tract of ground, about 350 feet or 200 druid cubits wide, and more than a mile and three quarters, or 6000 druid cubits, in length, inclosed quite round with a bank of earth, extending directly east and west. The goal and career are at the east end. The goal is a high bank of earth, raised with a slope inwards, on which the judges are supposed to have sat. The metæ are two tumuli, or small barrows, at the west end of the course. These hippodromes were called in the language of the country *rhedagua*, the racer *rhedagwr*, and the carriage *rheda*, from the British word *rhedeg* "to run". One of these hippodromes, about half a mile to the southward of Leicester, retains evident traces of the old name *rhedagua*, in the corrupted one of *rawdikes*. There is another of these, says Dr Stukeley, near Dorchester; another on the banks of the river Lowther, near Penrith in Cumberland; and another in the valley, just without the town of Royston.

HIPPOGLOSSUS, a species of fish belonging to the genus PLEURONECTES, which see in ICHTHYOLOGY *Index*.

HIPPOLYTUS, a son of Theseus and Hippolyte, famous in fabulous history for his virtue and his misfortunes. His stepmother Phædra fell in love with him, and when he refused to pollute his father's bed, she accused him to Theseus of offering violence to her person. Her accusation was readily believed, and Theseus intreated Neptune to punish the incontinence of his son. Hippolytus fled from the resentment of his father; and as he pursued his way along the sea shores, his horses were so frightened at the noise of sea calves which Neptune had purposely sent there, that they ran among the rocks till his chariot was broken and his body torn to pieces. Temples were raised to his memory, particularly at Trœzene, where he received divine honours. According to some accounts, Diana restored him to life.

HIPPOMANE, the MANCHINEEL-TREE; a genus of plants belonging to the monœcia class; and in the natural method ranking under the 38th order, *Tricoccæ*. See BOTANY *Index*.

HIPPOMANES, a sort of poison, famous among the ancients as an ingredient in amorous philters or love-charms. The word is Greek ἱππομανες, composed of ἱππος "a horse," and μανια "fury or madness."

Authors are not agreed about the nature of the hippomanes. Pliny describes it as a blackish caruncle found on the head of a new born-colt; which the dam bites off and eats as soon as she is delivered. He adds, that if she be prevented herein by any one's cutting it off before, she will not take to, nor bring up the young. Virgil, and after him Servius and Columella, describe it as a poisonous matter trickling from the pudendum of a mare when proud, or longing for the horse. At the end of Mr Bayle's Dictionary is a very learned dissertation on the hippomanes, and all its virtues both real and pretended.

HIPPONAX, a Greek poet, born at Ephesus 540 years before the Christian era. He cultivated the same satirical poetry as Archilochus, and was not inferior to him in the beauty or vigour of his lines. His satirical raillery obliged him to fly from Ephesus. As he was naturally deformed, two brothers, Buphalus and Anthermus, made a statue of him; which, by the ugliness of its features, exposed the poet to universal ridicule. Hipponax resolved to revenge the injury; and he wrote such bitter invectives and satirical lampoons against them, that they hanged themselves in despair. (*Cic. ad Famil.* vii. ep. 24.).

HIPPOPHAE, SEA-BUCKTHORN: a genus of plants belonging to the diœcia class; and in the natural method ranking under the 16th order, *Calyciflora*. See BOTANY *Index*.

HIPPOPHAGI, in *Ancient Geography*, a people of Scythia, so called from their living on horse-flesh; the fare at this day of the Tartars their descendants. Also a people of Persia (Ptolemy).

HIPPOPODES, HIPPOPEDES, or *Hippopodiæ*, composed of ἱππος *horse*, and πυς *foot*, in the ancient geography, an appellation given to a certain people situated on the banks of the Scythian sea, as being supposed to have had horses feet. The hippopodes are mentioned by Dionysius, Geogr. v. 310. Mela, lib. iii. cap. 6. Pliny, lib. iv. cap. 13. and St Augustine, *De Civit.* lib. xvi. cap. 8. But it is conjectured, that they had this appellation given them on account of their swiftness or lightness of foot. Mr Pennant supposes them to have been the inhabitants of the Bothnian gulf, and that they were the same sort of people as the *Finni Lignipedes* of Olaus. They wore snow-shoes; which he thinks might fairly give the idea of their being, like horses, hoofed and shod.

HIPPOPOTAMUS, the RIVER-HORSE; a genus of quadrupeds belonging to the order of belluæ. See MAMMALIA *Index*.

HIPPURIS, MARE'S-TAIL, a genus of plants belonging to the monandria class; and in the natural method ranking under the 15th order, *Inundatæ*. See BOTANY *Index*.

HIRÆA, a genus of plants belonging to the decandria class. See BOTANY *Index*.

HIRAM, a king of Tyre, contemporary with Solomon, whom he supplied with cedar, gold, silver, and other materials for building the temple. He died 1000 years B. C.

HIRAM of Tyre, an artist who assisted in the construction of Solomon's temple, and other public buildings at Jerusalem, flourished 1015 B. C.

HIRCANIA, in *Ancient Geography*. See HYRCANIA.

HIRCH-HORN, a town of Germany, in the circle of the lower Rhine, with a strong castle. It is seated on the side of a hill on the river Neckar, and belongs to the elector Palatine. E. Long. 9. 0. N. Lat. 49. 28.

HIRCUS, in *Astronomy*, a fixed star of the first magnitude, the same with Capella. It is also made use of by some writers for a comet, encompassed as it were with a mane, apparently rough and hairy.

HIRE, PHILIP DE LA, a French mathematician and astronomer of eminence, was born at Paris in the year 1640,

1640. His father, who was painter to his majesty, designing to bring him up to the same occupation, taught him drawing and such parts of the mathematics as are intimately connected with it. At the age of 20 he took a journey into Italy, to enlarge his knowledge of his favourite art, in which country he resided for about four years. The study of the mathematics afterwards occupied all his attention, which he continued to prosecute on his return to his native city; and the publication of some works having procured him so high a reputation, he was chosen a member of the Academy of Sciences in the year 1678.

When the celebrated minister Colbert conceived the design of constructing a better map of France than any at that time to be met with, De la Hire was nominated in conjunction with Picard, to make the necessary observations, which engaged his attention for some years in different provinces. But besides the chief object of his journies, he pholosophized upon every thing that occurred to him, in a particular manner on the variations of the magnetic needle, on refractions, and the height of mountains as ascertained by the barometer.

In the year 1683 he was employed in continuing the meridian line which had been begun by Picard in 1669. He continued it from Paris towards the north, and Cassini carried it on towards the south; but on the death of Colbert, which happened the same year, the work was laid aside in an unfinished state. He was afterwards employed, in conjunction with other eminent philosophers, in taking the necessary levels for the grand aqueducts which Louis XIV. was about to make.

The works which have been published by De la Hire are very numerous; and as he was professor of the Royal College and Academy of Architecture, he must have been constantly employed. He had the politeness, circumspection, and prudence of Italy, which made him appear too reserved in the estimation of his versatile countrymen, yet he was regarded by all as an honest, disinterested man. He died in the year 1718, at the great age of 78.

He published *Traité de Mechanique; Nouvelle Methode en Geometrie pour les Sections des Superficies Coniques et Cylindriques; De Cycloide; Nouveaux Elemens des Sections Coniques; les Lieux Geometriques; la Construction ou Effection des Equations; La Gnomonique*, and several others of less importance. That which gained him the greatest reputation all over Europe, was his *Sectiones Conicæ in novem libros distributæ*, considered by the best judges as an original work.

HIRING, in *Law*. See *Borrowing and Hiring*.

HIRPINI, in *Ancient Geography*, a people of Italy, next to the Samnites, to the south-east, and descendants from them; situated to the north of the Picentini, and to the west of the Apuli, having on the north the Apennine and a part of Samnium. Their name is from *Hirpus*, a term denoting a wolf in their language; either because under the conduct of this animal the colony was led and settled, according to Strabo; or because, like that prowling animal, they lived on plunder, according to Servius.

HIRSBERG, a town of Silesia, in the territory of Jauer, famous for its mineral baths. It is seated on the river Bofar, in E. Long. 17. 50. N. Lat. 50. 50.

HIRSCHFELD, a town of Germany, in the circle of the Upper Rhine, and capital of a principality of the same name, depending on a famous abbey which was secularized in favour of the house of Cassel. It is seated on the river Fulda, in E. Long. 9. 52. N. Lat. 51. 46.

HIRTELLA, a genus of plants belonging to the pentandria class; and in the natural method ranking with those of which the order is doubtful. See Botany *Index*.

HIRUDO, the leech; a genus of insects belonging to the order of vermes intestina. See Helminthology *Index*.

HIRUNDO, a genus of birds belonging to the order of passeres. See Ornithology *Index*.

HISPA, in *Zoology*, a genus of insects belonging to the order coleoptera. See Entomology *Index*.

HISPALIS, a town of Bætica, in the Farther Spain; an ancient mart or trading town on the Bætis, navigable quite up to it for ships of burthen, and thence to Corduba for river barges. Called *Colonia Romulensis*. It had also a conventus juridicus, a court of justice or assizes, (Pliny). Now called *Seville*. W. Long. 6. N. Lat. 37.

HISPANIA, called *Hesperia Ultima*, (Horace), because the westmost part of Europe; also *Iberia*, from the river Iberus. Its name *Hispania*, or *Spania*, (Greek) is of Phœnician original, from its great number of rabbits: the Phœnicians, who settled several colonies on the coast, calling it *Spanjah* from these animals. It has the sea on every side, except on that next to Gaul, from which it is separated by the Pyrenees. The Romans at first divided it into the Farther and Hither Spain, under two prætors. In that state it continued down to Augustus; who divided the Farther Spain into Bætica, which he left to the people to be governed by a proconsul; and into Lusitania, which he added to his own provinces; calling the Hither Spain *Tarraconensis*. Hispania was a country celebrated for its fertility, of which it has greatly fallen short in modern times. The people were of a warlike turn, (Strabo); and their bodies being formed for hardships and labour, they ever preferred war to peace, and were remarkably prodigal of life (Justin, Sil. Italicus). Spain has produced several great men, both in a literary and a political capacity. See Spain.

HISPANIOLA, called also St Domingo, the largest of the Antilles or Caribbee islands, extending about 420 miles from east to west, and 120 in breadth from north to south; lying between 17° 37′ and 20° of N. Lat. and between 67° 35′ and 74° 15′ W. Long. The climate is hot, but not reckoned unwholesome; and some of the inhabitants are said to arrive at the age of 120. It is sometimes refreshed by breezes and rains; and its salubrity is likewise in a great measure owing to the beautiful variety of hills and valleys, woods and rivers, which everywhere present themselves. It is indeed reckoned by far the finest and most pleasant island of the Antilles, as being the best accommodated to all the purposes of life when duly cultivated.

This island, famous for being the earliest settlement of the Spaniards in the new world, was at first in high estimation for the quantity of gold it supplied: this wealth diminished with the inhabitants of the country, whom they obliged to dig it out of the bowels of the earth;

Hispaniola.

earth; and the source of it was entirely dried up, when they were exterminated, which was quickly done by a series of the most shocking barbarities that ever disgraced the history of any nation. Benzoni relates, that of two millions of inhabitants, contained in the island when discovered by Columbus in 1492, scarce 153 were alive in 1545. A vehement desire of opening again this source of wealth inspired the thought of getting slaves from Africa; but, besides that these were found unfit for the labours they were destined to, the multitude of mines, which then began to be wrought on the continent, made those of Hispaniola no longer of any importance. An idea now suggested itself, that their negroes, which were healthy, strong, and patient, might be usefully employed in husbandry; and they adopted, through necessity, a wise resolution, which, had they known their own interest, they would have embraced by choice.

The produce of their industry was at first extremely small, because the labourers were few. Charles V. who, like most sovereigns, preferred his favourites to every thing, had granted an exclusive right of the slave-trade to a Flemish nobleman, who made over his privilege to the Genoese. Those avaricious republicans conducted this infamous commerce as all monopolies are conducted; they resolved to sell dear, and they sold but few. When time and competition had fixed the natural and necessary price of slaves, the number of them increased. It may easily be imagined, that the Spaniards, who had been accustomed to treat the Indians as beasts, did not entertain a higher opinion of these negro Africans, whom they substituted in their place. Degraded still farther in their eyes by the price they had paid for them, even religion could not restrain them from aggravating the weight of their servitude. It became intolerable, and these wretched slaves made an effort to recover the unalienable rights of mankind. Their attempt proved unsuccessful; but they reaped this benefit from their despair, that they were afterwards treated with less inhumanity.

This moderation (if tyranny cramped by the apprehension of revolt can deserve that name) was attended with good consequences. Cultivation was pursued with some degree of success. Soon after the middle of the 16th century, the mother country drew annually from this colony ten millions weight of sugar, a large quantity of wood for dyeing, with tobacco, cocoa, cassia, ginger, and cotton, in abundance. One might imagine, that such favourable beginnings would give both the desire and the means of carrying them further; but a train of events, more fatal each than the other, ruined these hopes.

The first misfortune arose from the depopulation of the island. The Spanish conquests on the continent should naturally have contributed to promote the success of an island, which nature seemed to have formed to be the centre of that vast dominion arising around it, to be the staple of the different colonies. But it fell out quite otherwise: on a view of the immense fortunes raising in Mexico, and other parts, the richest inhabitants of Hispaniola began to despise their settlements, and quitted the true source of riches, which is on the surface of the earth, to go and ransack the bowels of it for veins of gold, which are quickly exhausted. The government endeavoured in vain to put a stop to this emigration; the laws were always either artfully eluded, or openly violated.

Hispaniola.

The weakness, which was a necessary consequence of such a conduct, leaving the coasts without defence, encouraged the enemies of Spain to ravage them. Even the capital of this island was taken and pillaged by that celebrated English sailor, Sir Francis Drake. The cruizers of less consequence contented themselves with intercepting vessels in their passage through those latitudes, the best known at that time of any in the new world. To complete these misfortunes, the Castilians themselves commenced pirates. They attacked no ships but those of their own nation; which were more rich, worse provided, and worse defended, than any others. The custom they had of fitting out ships clandestinely, in order to procure slaves, prevented them from being known; and the assistance they purchased from the ships of war, commissioned to protect the trade, insured to them impunity.

The foreign trade of the colony was its only resource in this distress; and that was illicit: but as it continued to be carried on, notwithstanding the vigilance of the governors, or, perhaps, by their connivance, the policy of an exasperated and short-sighted court exerted itself in demolishing most of the sea-ports, and driving the miserable inhabitants into the inland country. This act of violence threw them into a state of dejection; which the incursions and settlement of the French on the island afterwards carried to the utmost pitch. The latter, after having made some unsuccessful attempts to settle on the island, had part of it yielded to them in 1697, and afterwards enjoyed by far the best share.

Spain, totally taken up with that vast empire which she had formed on the continent, used no pains to dissipate this lethargy. She even refused to listen to the solicitations of her Flemish subjects, who earnestly pressed that they might have permission to clear those fertile lands. Rather than run the risk of seeing them carry on a contraband trade on the coasts, she chose to bury in oblivion a settlement which had been of consequence, and was likely to become so again.

This colony, which had no longer any intercourse with the mother country but by a single ship of no great burthen, that arrived from thence every third year, consisted, in 1717, of 18,410 inhabitants, including Spaniards, mestees, negroes, or mulattoes. The complexion and character of these people differed according to the different proportions of American, European, and African blood they had received from that natural and transient union which restores all races and conditions to the same level. These demi-savages, plunged in the extreme of sloth, lived upon fruits and roots, dwelt in cottages without furniture, and most of them without clothes. The few among them, in whom indolence had not totally suppressed the sense of decency and taste for the conveniencies of life, purchased clothes of their neighbours the French in return for their cattle, and the money sent to them for the maintenance of two hundred soldiers, the priests, and the government.

In the year 1788, the revolutionary principles which began to agitate Europe, made their way to the West Indies.

Hispaniola. Indies. The French association for abolishing the slave trade, called *Amis des Noirs*, kept up a correspondence with such rich Mulattoes as had come to France for their education, and its members laboured to convince them that there was neither civil nor political distinction between them and the white people. These ideas were strengthened by the celebrated declaration of the national assembly, that all men are born and continue free, possessing equal rights. The consequence was, that the Mulattoes of Hispaniola broke out into open rebellion, but for want of unity of design they were soon overpowered.

This spirit, however, still continued to exert itself, and the assembly of France having avowed its design not to interfere with the internal affairs of the colony, discontent and remonstrances were exhibited by the factious friends of the negroes. They considered this as countenancing the African trade, and an acknowledgement that the planters were not colonists, but independent people. This idea struck the colonists themselves, for by a decree they debarred the king's delegate from having a negative on any of their future acts. The *Amis des Noirs*, in the mean time, exerted all their influence to kindle and cherish a spirit of rebellion in the minds of the people of colour; for which purpose they carefully taught one James Oge, then residing at Paris, the doctrines of equality and the rights of man, urged him to return to St Domingo, place himself at the head of his people, and rescue them from the oppression of the whites, pledging themselves to procure arms and ammunition for him in America, that the affair might be kept as profound a secret as possible. He accordingly set sail for New England in July 1790; but all the vigilance of the parties concerned could not deceive the government of France, and his portrait was sent to St Domingo before him. He made the island in October, and declared soon after by virtue of a manifesto, that if the privileges of the whites were not conferred on all without discrimination, he would instantly take up arms to obtain them by force. With a small detachment of 200 men he massacred all the white people that came in his way, as well as all those of his own colour who refused to join him. This little army was very soon subdued, and their misguided leader was punished as a traitor.

The French national assembly decreed that every person 25 years old and upwards, if he possessed property, and had lived two years in the colony, and paid taxes, should be permitted to elect the members of the colonial assembly, on which account the people of colour inferred, that this privilege was bestowed upon them. It is uncharitable to believe that this was the intention of the national assembly; but Gregoire and others carried their favourite point, that Mulattoes born of free parents might not only elect their own representatives, but also sit as members in the colonial assemblies. In consequence of this measure, all the white people fell victims to the indignation of the people of colour. The negroes were now fully determined to recover their liberty. On the 23d of August 1791, the people in the town of the Cape were informed that the slaves in the adjacent parishes had revolted, a report which was too soon confirmed by the arrival of those who had escaped the massacre. Hostilities commenced between the two parties, and terminated with the loss of 2000 white people, while not fewer than 10,000 Mulattoes and Negroes perished by famine and the sword, and several hundreds by the hands of the executioner. Hispaniola.

The news of these transactions having reached Paris, the members of the assembly were persuaded that they had carried their principles of equality by much too far, and they repealed their celebrated decree which had placed the people of colour on a footing with the whites. Commissioners (three in number) were sent to restore peace between the whites and Mulattoes, but as two of them were men of infamous characters, and incapable of extinguishing the flames of rebellion, they returned to France, without being able to accomplish the object of their mission.

The *Amis des Noirs* having again acquired the superiority in the national assembly, Santhonax, Polverel, and Ailhaud with 6000 men from the national guards, were ordered for St Domingo. The governor of the island perceiving that these commissioners took all the authority on themselves, and resolved to reduce him to a cypher, he remonstrated against their proceedings, in consequence of which he was immediately arrested, and sent a state prisoner to France. The commissioners afterwards disagreeing among themselves, Ailhaud was dismissed from their councils.

Unsuccessful attempts were made by the British government to subdue the commissioners and their adherents; but after performing prodigies of valour, the troops of Britain were compelled to relinquish the island, more perhaps by disease than the sword of the enemy. The chief government of it then fell into the hands of Toussaint L'Ouverture, by whom it was converted into an independent republic, the supreme authority over which he continued to hold till the signing the preliminaries of peace in 1801.

When this event took place, Bonaparte, with the consent of the British government, sent a fleet from Brest, with a considerable army under the command of General Le Clerc, who, after various actions at length subdued Toussaint; and, notwithstanding that French general pledged himself for his safety, he was in a short time sent prisoner to France, where he soon after died, or, according to conjectures not very improbable, was put to death by order, or with the connivance, of the ruler of that kingdom.

The French troops under General Rochambeau being obliged to evacuate Hispaniola, the freedom and independence of the island were proclaimed by the conquering chief, Dessalines, who assured all those who were willing to remain in it, of his cordial protection, and allowing such as were so inclined freely to depart with the French army. The successes which attended the arms of this black chief, and the goodness of the cause in which he fought, were very much tarnished by the horrid massacres of the white people, which he not only countenanced, but attended in person. Attempts to negociate with Dessalines were made by the British government, but without effect, his demands were so extravagant which he held out as the basis; but his army was in such a forlorn condition, as to create no apprehensions of danger from such an enemy. After this, however, Dessalines experienced a signal defeat on the plain of St Charles from General Ferrand, when 1200 of his men were found dead on the field, and himself obliged to retire towards the Cape.

Hispaniola.

St Domingo was afterwards denominated Hayti, of which Jacques Deſſalines was choſen the firſt emperor. It was declared a free, ſovereign, and independent ſtate, and ſlavery was aboliſhed. The citizens were pronounced brothers at home, equal in the eye of the law; and it was declared that one man could enjoy no advantages over another, but ſuch as might originate from ſervices done to the cauſe of liberty and independence. Such as emigrate are to forfeit ever after the title of citizen of Hayti, and alſo if they are found deſerving of diſgraceful puniſhments. Every citizen muſt have ſome mechanic art, and no white man is to be permitted to ſet a foot upon the iſland with the title of a proprietor. All diſtinction of colour was ordered to ceaſe, and the people of Hayti to be ever after known by the generic title of *Blacks*.

The empire of Hayti is one and indiviſible, and its territory diſtributed into ſix military diviſions. The iſlands of Samana, La Tortu, La Gonave, Les Cayemites, La Saone, L'Iſle á Vache, and other adjacent iſlands, are to be conſidered as integral parts of this empire.

Hiſter, Hiſtoriographer.

The emperor is commander in chief of the army, and the empreſs is to have a fixed annual allowance after the deceaſe of the emperor, as princeſs dowager. Laws are made, ſealed and promulgated by the emperor; and he appoints at his pleaſure all counſellors of ſtate, generals, and other agents of the empire, ſea officers, judges, and other public functionaries. The houſe of every citizen is by the law declared to be his aſylum; marriage is declared a civil rite, divorce is allowed, all religious opinions tolerated, and good faith in commercial tranſactions is to be religiouſly maintained. The conſtitution was accepted at the imperial palace on the 20th of May 1805 by the emperor Jacques Deſſalines, and he promiſed to defend it to the laſt breath of his life.

HISTER, a genus of the coleoptera order of inſects. See Entomology *Index*.

HISTORIOGRAPHER, a profeſſed hiſtorian, or writer of hiſtory. See the next article.

The hiſtoriographer to his majeſty is an officer under the lord chamberlain; his ſalary 200l. per annum. There is an office of the ſame kind in Scotland, with the ſame ſalary.

HISTORY.

HISTORY, in general, ſignifies an account of ſome remarkable facts which have happened in the world, arranged in the true order in which they actually took place, together with the cauſes to which they were owing, and the different effects they have produced as far as can be diſcovered.—The word is Greek, Ἱστορια; and literally denotes a ſearch of curious things, or a deſire of knowing, or even a rehearſal of things we have ſeen; being formed from the verb Ἱστορειν, which properly ſignifies to know a thing by having ſeen it. But the idea is now much more extenſive, and is applied to the knowledge of things taken from the report of others. The origin is from the verb ιστημι, "I know;" and hence it is, that among the ancients ſeveral of their great men were called *polyhiſtores*, i. e. perſons of various and general knowledge.

Sometimes, however, the word *hiſtory* is uſed to ſignify a deſcription of things, as well as an account of facts. Thus Theophraſtus calls his work in which he has treated of the nature and properties of plants, an *hiſtory of plants;* and we have a treatiſe of Ariſtotle, intitled an *hiſtory of animals;* and to this day the deſcriptions of plants, animals, and minerals, are called by the general name of *natural hiſtory*.

1 Hiſtory how divided.

But what chiefly merits the name of hiſtory, and what is here conſidered as ſuch, is an account of the principal tranſactions of mankind ſince the beginning of the world; and which naturally divides itſelf into two parts, namely, *civil* and *eccleſiaſtical*. The firſt contains the hiſtory of mankind in their various relations to one another, and their behaviour, for their own emolument, or that of others, in common life; the ſecond conſiders them as acting, or pretending to act, in obedience to what they believe to be the will of the Supreme Being.—Civil hiſtory, therefore, includes an account of all the different ſtates that have exiſted in the world, and likewiſe of thoſe men who in different ages of the world have moſt eminently diſtinguiſhed themſelves either for their good or evil actions. This laſt part of civil hiſtory is uſually termed Biography.

Hiſtory is now conſidered as a very conſiderable branch of polite literature: few accompliſhments are more valued than an accurate knowledge of the hiſtories of different nations; and ſcarce any literary production is more regarded than a well-written hiſtory of any nation.

2 Of the ſtudy of hiſtory.

With regard to the ſtudy of hiſtory, we muſt conſider, that all the revolutions which have happened in the world have been owing to two cauſes. 1. The connexions between the different ſtates exiſting together in the world at the ſame time, or their different ſituations with regard to one another; and, 2. The different characters of the people who in all ages conſtituted theſe ſtates, their different geniuſes and diſpoſitions, &c. by which they were either prompted to undertake ſuch and ſuch actions of themſelves, or were eaſily induced to it by others. The perſon who would ſtudy hiſtory, therefore, ought in the firſt place to make himſelf acquainted with the ſtate of the world in general in all different ages; what nations inhabited the different parts of it; what their extent of territory was; at what particular time they aroſe, and when they declined. He is then to inform himſelf of the various events which have happened to each particular nation; and, in ſo doing, he will diſcover many of the cauſes of thoſe revolutions, which before he only knew as facts. Thus, for inſtance, a perſon may know the Roman hiſtory from the time of Romulus, without knowing in the leaſt why the city of Rome happened to be built at that time. This cannot be underſtood without a particular knowledge of the former ſtate of Italy, and even of Greece and

Aſia;

Civil Hiſtory.

Aſia; ſeeing the origin of the Romans is commonly traced as high as Æneas, one of the heroes of Troy. But when all this is done, which indeed requires no ſmall labour, the hiſtorian hath yet to ſtudy the genius and diſpoſitions of the different nations, the characters of thoſe who were the principal directors of their actions, whether kings, miniſters, generals or prieſts; and when this is accompliſhed, he will diſcover the cauſes of thoſe tranſactions in the different nations which have given riſe to the great revolutions above mentioned: after which, he may aſſume the character of one who is perfectly verſed in hiſtory.

The firſt *outline* of hiſtory, as it may be called, is moſt eaſily obtained by the inſpection of an hiſtorical chart; and that ſubjoined to the preſent treatiſe will anſwer the purpoſe as well as any. Along with this it will be proper to peruſe a ſhort abridgment of general hiſtory, from the creation of the world to the preſent time; but in this way there have been but very few attempts attended with any tolerable ſucceſs. The following is collected from reſpectable authorities, and may ſerve to help the ideas of the reader on this ſubject.

Sect. I. *Civil Hiſtory.*

3 Civil hiſtory how divided.

History, though ſeemingly incapable of any natural diviſion, will yet be found, on a nearer inſpection, to reſolve itſelf into the following periods, at each of which a great revolution took place, either with regard to the whole world, or a very conſiderable part of it. 1. The creation of man. 2. The flood. 3. The beginning of profane hiſtory, i. e. when all the fabulous relations of heroes, demi-gods, &c. were expelled from hiſtorical narrations, and men began to relate facts with ſome regard to truth and credibility. 4. The conqueſt of Babylon by Cyrus, and the deſtruction of the Babylonian empire. 5. The reign of Alexander the Great, and the overthrow of the Perſian empire. 6. The deſtruction of Carthage by the Romans, when the latter had no longer any rival capable of oppoſing their deſigns. 7. The reign of the emperor Trajan, when the Roman empire was brought to its utmoſt extent. 8. The diviſion of the empire under Conſtantine. 9. The deſtruction of the weſtern empire by the Heruli, and the ſettlement of the different European nations. 10. The riſe of Mahomet, and the conqueſts of the Saracens and Turks. 11. The cruſades, and all the ſpace intervening between that time and the preſent.

4 Moſaic account of the creation the only probable one.

Concerning the number of years which have elapſed ſince the creation of the world, there have been many diſputes. The compilers of the Univerſal Hiſtory determine it to have taken place in the year 4305 B. C. ſo that, according to them, the world is now (1806) in the 6111th year of its age. Others think it was created only 4000 years B. C. ſo that it hath not yet attained its 6000th year. Be this as it will, however, the whole account of the creation reſts on the truth of the Moſaic hiſtory; and this we muſt of neceſſity accept, becauſe we can find no other which does not either abound with the groſſeſt abſurdities, or lead us into abſolute darkneſs. The Chineſe and Egyptian pretenſions to antiquity are ſo abſurd and ridiculous, that the bare reading muſt be a ſufficient confutation of them to every reaſonable perſon. See the articles China and Egypt. Some hiſtorians and philoſophers are inclined to diſcredit the Moſaic accounts, from the appearances of volcanoes, and other natural phenomena: but their objections are by no means ſufficient to invalidate the authority of the ſacred writings; not to mention that every one of their own ſyſtems is liable to inſuperable objections. See Geology. It is therefore reaſonable for every perſon to accept of the Moſaic account of the creation as truth: but an hiſtorian is under an abſolute neceſſity of doing it, becauſe, without it, he is quite deſtitute of any ſtandard or ſcale by which he might reduce the chronology of different nations to any agreement; and, in ſhort, without receiving this account as true, it would be in a manner impoſſible at this day to write a general hiſtory of the world.

Hiſtory from the creation to the flood.

1. The tranſactions during the firſt period, viz. from the creation to the flood, are very much unknown, nothing indeed being recorded of them but what is to be found in the firſt ſix chapters of Geneſis. In general, we know, that men were not at that time in a ſavage ſtate; they had made ſome progreſs in the arts, had invented muſic, and found out the method of working metals. They ſeem alſo to have lived in one vaſt community, without any of thoſe diviſions into different nations which have ſince taken place, and which evidently proceeded from the confuſion of languages. The moſt material part of their hiſtory, however, is, that having once begun to tranſgreſs the divine commands, they proceeded to greater and greater lengths of wickedneſs, till at laſt the Deity thought proper to ſend a flood on the earth, which deſtroyed the whole human race except eight perſons, viz. Noah and his family. This terrible cataſtrophe happened, according to the Hebrew copy of the Bible, 1656 years after the creation; according to the Samaritan copy 1307. For the different conjectures concerning the natural cauſes of the flood, ſee the article Deluge.

6 From the flood to the beginning of profane hiſtory.

2. For the hiſtory of the ſecond period we muſt again have recourſe to the Scriptures, almoſt as much as for that of the firſt. We now find the human race reduced to eight perſons, poſſeſſed of nothing but what they had ſaved in the ark, and the whole world to be ſtored with animals from thoſe which had been preſerved along with theſe eight perſons. In what country their original ſettlement was, no mention is made. The ark is ſuppoſed to have reſted on Mount Ararat in Armenia *; but it is impoſſible to know whether Noah and his ſons made any ſtay in the neighbourhood of this mountain or not. Certain it is, that, ſome time after, the whole or the greateſt part of the human race were aſſembled in Babylonia, where they engaged in building a tower. This gave offence to the Deity; ſo that he puniſhed them by confounding their language; whence the diviſion of mankind into different nations.

* See *Ararat*.

7 Nations deſcended from Japhet.

According to a common opinion, Noah when dying left the whole world to his ſons, giving Aſia to Shem, Africa to Ham, and Europe to Japhet. But this hath not the leaſt foundation in Scripture. By the moſt probable accounts, Gomer the ſon of Japhet was the father of the Gomerians or Celtes; that is, all the barbarous nations who inhabited the northern parts of Europe,

Europe, under the various names of *Gauls*, *Cimbrians*, *Goths*, &c. and who alſo migrated to Spain, where they were called *Celtiberians*. From Magog, Meſhech, and Tubal, three of Gomer's brethren, proceeded the Scythians, Sarmatians, Tartars, and Moguls. The three other ſons of Japhet, Madai, Javan, and Tiras, are ſaid to have been the fathers of the Medes, the Ionians, Greeks and Thracians.

8 From Shem.

The children of Shem were Elam, Aſhur, Arphaxad, Lud, and Aram. The firſt ſettled in Perſia, where he was the father of that mighty nation: The deſcendants of Aſhur peopled Aſſyria (now *Curdeſtan*): Arphaxad ſettled in Chaldea. Lud is ſuppoſed by Joſephus to have taken up his reſidence in Lydia; though this is much controverted. Aram, with more certainty, is thought to have ſettled in Meſopotamia and Syria.

9 From Ham.

The children of Ham were Cuſh, Mizraim, Phut, and Canaan. The firſt is thought to have remained in Babylonia, and to have been king of the ſouth-eaſtern parts of it, afterwards called *Khuzeſtan*. His deſcendants are ſuppoſed to have removed into the eaſtern parts of Arabia; from whence they by degrees migrated into the correſponding part of Africa. The ſecond peopled Egypt, Ethiopia, Cyrenaica, Libya, and the reſt of the northern parts of the ſame continent. The place where Phut ſettled is not known: but Canaan is univerſally allowed to have ſettled in Phœnicia; and to have founded thoſe nations who inhabited Judea, and were afterwards exterminated by the Jews.

Almoſt all the countries of the world, at leaſt of the eaſtern continent, being thus furniſhed with inhabitants, it is probable that for many years there would be few or no quarrels between the different nations. The paucity of their numbers, their diſtance from one another, and their diverſity of language, would contribute to keep them from having much communication with each other. Hence according to the different circumſtances in which the different tribes were placed, ſome would be more civilized and others more barbarous. In this interval alſo the different nations probably acquired different characters, which afterwards they obſtinately retained, and manifeſted on all occaſions; hence the propenſity of ſome nations to monarchy, as the Aſiatics, and the enthuſiaſtic deſire of the Greeks for liberty and republicaniſm, &c.

10 Foundation of the kingdoms of Babylonia, Aſſyria, &c.

The beginning of monarchical government was very early; Nimrod the ſon of Cuſh having found means to make himſelf king of Babylonia. In a ſhort time Aſhur emigrated from the new kingdom; built Nineveh, afterwards capital of the Aſſyrian empire; and two other cities, called *Rezen* and *Rehoboth*, concerning the ſituation of which we are now much in the dark. Whether Aſhur at this time ſet up as a king for himſelf, or whether he held theſe cities as vaſſal to Nimrod, is now unknown. It is probable however, that about the ſame time various kingdoms were founded in different parts of the world; and which were great or ſmall according to different circumſtances. Thus the Scripture mentions the kings of Egypt, Gerar, Sodom, Gomorrha, &c. in the time of Abraham; and we may reaſonably ſuppoſe, that theſe kings reigned over nations which had exiſted for ſome conſiderable time before.

11 Migration of the Iſraelites from Egypt.

The firſt conſiderable revolution we read of is the migration of the Iſraelites out of Egypt, and their eſtabliſhment in the land of Canaan. For the hiſtory of theſe tranſactions we muſt refer to the Old Teſtament, where the reader will ſee that it was attended with the moſt terrible cataſtrophe to the Egyptians, and with the utter extermination of ſome nations, the deſcendants of Ham, who inhabited Judæa. Whether the overthrow of Pharaoh in the Red ſea could affect the Egyptian nation in ſuch a manner as to deprive them of the greateſt part of their former learning, and to keep them for ſome ages after in a barbarous ſtate, is not eaſily determined; but unleſs this was the caſe, it ſeems exceedingly difficult to account for the total ſilence of their records concerning ſuch a remarkable event, and indeed for the general confuſion and uncertainty in which the early hiſtory of Egypt is involved. The ſettlement of the Jews in the promiſed land of Canaan, is ſuppoſed to have happened about 1491 B. C.

12 Hiſtory of the Greeks.

For near 200 years after this period, we find no accounts of any other nations than thoſe mentioned in Scripture. About 1280 B. C. the Greeks began to make other nations feel the effects of that enterpriſing and martial ſpirit for which they were ſo remarkable, and which they had undoubtedly exerciſed upon one another long before. Their firſt enterpriſe was an invaſion of Colchis (now *Mingrelia*), for the ſake of the golden fleece. Whatever was the nature of this expedition, it is probable they ſucceeded in it; and it is likewiſe probable, that it was this ſpecimen of the riches of Aſia which inclined them ſo much to Aſiatic expeditions ever after. All this time we are totally in the dark about the ſtate of Aſia and Africa, except in ſo far as can be conjectured from Scripture. The ancient empires of Babylon, Aſſyria, and Perſia, probably ſtill continued in the former continent, and Egypt and Ethiopia ſeem to have been conſiderable kingdoms in the latter.

About 1184 years B. C. the Greeks again diſtinguiſhed themſelves by their expedition againſt Troy, a city of Phrygia Minor; which they plundered and burnt, maſſacring the inhabitants with the moſt unrelenting cruelty. Æneas, a Trojan prince, eſcaped with ſome followers into Italy, where he became the remote founder of the Roman empire. At this time Greece was divided into a number of ſmall principalities, moſt of which ſeem to have been in ſubjection to Agamemnon king of Mycenæ. In the reign of Atreus, the father of this Agamemnon, the Heraclidæ, or deſcendants of Hercules, who had been formerly baniſhed by Euryſtheus, were again obliged to leave this country. Under their champion Hyllus they claimed the kingdom of Mycenæ as their right, pretending that it belonged to their great anceſtor Hercules, who was unjuſtly deprived of it by Euryſtheus †. The controverſy was decided by ſingle combat; but Hyllus being killed, they departed, as had been before agreed, under a promiſe of not making any attempt to return for 50 years. About the time of the Trojan war, alſo, we find the Lydians, Myſians, and ſome other nations of Aſia Minor, firſt mentioned in hiſtory. The names of the Greek ſtates mentioned during this uncertain period are, 1. Sicyon. 2. Leleg. 3. Meſſina. 4. Athens. 5. Crete. 6. Argos. 7. Sparta. 8. Pelaſgia. 9. Theſſaly.

† See *Hercules*.

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9. Theſſaly. 10. Attica. 11. Phocis. 12. Locris. 13. Ozela. 14. Corinth. 15. Eleuſina. 16. Elis. 17. Pilus. 18. Arcadia. 19. Egina. 20. Ithaca. 21. Cephalone. 22. Phthia. 23. Phocidia. 24. Ephyra. 25. Eolia. 26. Thebes. 27. Caliſta. 28. Etolia. 29. Doloppa. 30. Oechalia. 31. Mycenæ. 32. Eubœa. 33. Mynia. 34. Doris. 35. Phera. 36. Iola. 37. Trachina. 38. Thraſprocia. 39. Myrmidonia. 40. Salamine. 41. Scyros. 42. Hyperia or Melité. 43. The Vulcanian iſles. 44. Megara. 45. Epirus. 46. Achaia. 47. The iſles of the Egean ſea. Concerning many of theſe we know nothing beſides their names: the moſt remarkable particulars concerning the reſt may be found under their reſpective articles.

13 Of the Jews.

About 1048 B. C. the kingdom of Judea under King David approached its utmoſt extent of power. In its moſt flouriſhing condition, however, it never was remarkable for the largeneſs of its territory. In this reſpect it ſcarce exceeded the kingdom of Scotland; though, according to the accounts given in ſcripture, the magnificence of Solomon was ſuperior to that of the moſt potent monarchs on earth. This extraordinary wealth was owing partly to the ſpoils amaſſed by King David in his conqueſts over his various enemies, and partly to the commerce with the Eaſt Indies which Solomon had eſtabliſhed. Of this commerce he owed his ſhare to the friendſhip of Hiram king of Tyre, a city of Phœnicia, whoſe inhabitants were now the moſt famed for commerce and ſkill in maritime affairs of any in the whole world.

After the death of Solomon, which happened about 975 B. C. the Jewiſh empire began to decline; and ſoon after many powerful ſtates aroſe in different parts of the world. The diſpoſition of mankind in general ſeems now to have taken a new turn, not eaſily accounted for. In former times, whatever wars might have taken place between neighbouring nations, we have no account of any extenſive empire in the whole world, or that any prince undertook to reduce far diſtant nations to his ſubjection. The empire of Egypt indeed is ſaid to have been extended immenſely to the eaſt, even before the days of Seſoſtris. Of this country, however, our accounts are ſo imperfect, that ſcarce any thing can be concluded from them. But now, as it were all at once, we find almoſt every nation aiming at univerſal monarchy, and refuſing to ſet any bounds whatever to its ambition. The firſt ſhock given to the Jewiſh grandeur was the diviſion of the kingdom into two through the imprudence of Rehoboam. This rendered it more eaſily a prey to Shiſhak king of Egypt; who five years after came and pillaged Jeruſalem, and all the fortified cities of the kingdom of Judah. The commerce to the Eaſt Indies was now diſcontinued, and conſequently the ſources of wealth in a great meaſure ſtopped; and this, added to the perpetual wars between the kings of Iſrael and Judah, contributed to that remarkable and ſpeedy decline which is now ſo eaſily to be obſerved in the Jewiſh affairs.

Whether this king Shiſhak was the Seſoſtris of profane writers or not, his expedition againſt Jeruſalem as recorded in ſcripture ſeems very much to reſemble the deſultory conqueſts aſcribed to Seſoſtris. His infantry is ſaid to have been innumerable, compoſed of different African nations; and his cavalry 60,000, with 1200 chariots; which agrees pretty well with the mighty armament aſcribed to Seſoſtris, and of which an account is given under the article EGYPT, N° 2. There indeed his cavalry are ſaid to have been only 24,000; but the number of his chariots is increaſed to 27,000; which laſt may not unreaſonably be reckoned an exaggeration, and theſe ſupernumerary chariots may have been only cavalry; but unleſs we allow Seſoſtris to be the ſame with Shiſhak, it ſeems impoſſible to fix on any other king of Egypt that can be ſuppoſed to have undertaken this expedition in the days of Solomon.

Though the Jews obtained a temporary deliverance from Shiſhak, they were quickly after attacked by new enemies. In 941 B. C. one Zerah an Ethiopian invaded Judæa with an army of a million of infantry and 300 chariots; but was defeated with great ſlaughter by Aſa king of Judah, who engaged him with an army of 580,000 men. About this time alſo we find the Syrians grown a conſiderable people, and bitter enemies both to the kings of Iſrael and Judah; aiming in fact at the conqueſt of both nations. Their kingdom commenced in the days of David, under Hadadezer, whoſe capital was Zobah, and who probably was at laſt obliged to become David's tributary, after having been defeated by him in ſeveral engagements. Before the death of David, however, one Rezon, who it ſeems had rebelled againſt Hadadezer, having found means to make himſelf maſter of Damaſcus, erected there a new kingdom, which ſoon became very powerful. The Syrian princes being thus in the neighbourhood of the two rival ſtates of Iſrael and Judah (whoſe capitals were Samaria and Jeruſalem), found it an eaſy matter to weaken them both, by pretending to aſſiſt the one againſt the other; but a detail of the tranſactions between the Jews and Syrians is only to be found in the Old Teſtament, to which we refer. In 740 B. C. however, the Syrian empire was totally deſtroyed by Tiglath Pileſer king of Aſſyria; as was alſo the kingdom of Samaria by Shalmaneſer his ſucceſſor in 721 B. C. The people were either maſſacred, or carried into captivity into Media, Perſia, and the countries about the Caſpian ſea.

14 Of the Syrians.

15 Of the Weſtern nations.

While the nations of the eaſt were thus deſtroying each other, the foundations of very formidable empires were laid in the weſt, which in proceſs of time were to ſwallow up almoſt all the eaſtern ones. In Africa, Carthage was founded by a Tyrian colony, about 869 B. C. according to thoſe who aſcribe the higheſt antiquity to that city; but, according to others, it was founded only in 769 or 770 B. C. In Europe a very conſiderable revolution took place about 900 B. C. The Heraclidæ, whom we have formerly ſeen expelled from Greece by Atreus the father of Agamemnon, after ſeveral unſucceſsful attempts, at laſt conquered the whole Peloponneſus. From this time the Grecian ſtates became more civilized, and their hiſtory becomes leſs obſcure. The inſtitution, or rather the revival and continuance, of the Olympic games, in 776 B. C. alſo greatly facilitated the writing not only of their hiſtory, but that of other nations; for as each Olympiad conſiſted of four years, the chronology of every important event became indubitably fixed by referring it to ſuch and ſuch an Olympiad. In 748 B. C.

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or the last year of the seventh Olympiad, the foundations of the city of Rome were laid by Romulus; and, 43 years after, the Spartan state was new modelled, and received from Lycurgus those laws, by observing of which it afterwards arrived at such a pitch of splendor.

16 State of the world at the beginning of the third general period.

3. With the beginning of the 28th Olympiad, or 568 B. C. commences the third general period abovementioned, when profane history becomes somewhat more clear, and the relations concerning the different nations may be depended upon with some degree of certainty. The general state of the world was at that time as follows.—The northern parts of Europe were either thinly inhabited, or filled with unknown and barbarous nations, the ancestors of those who afterwards destroyed the Roman empire. France and Spain were inhabited by the Gomerians or Celtes. Italy was divided into a number of petty states, arising partly from Gaulish and partly from Grecian colonies; among whom the Romans had already become formidable. They were governed by their king Servius Tullius; had increased their city by the demolition of Alba Longa, and the removal of its inhabitants to Rome; and had enlarged their dominions by several cities taken from their neighbours. Greece was also divided into a number of small states, among which the Athenians and Spartans, being the most remarkable, were rivals to each other. The former had, about 599 B. C. received an excellent legislation from Solon, and were enriching themselves by navigation and commerce: the latter were become formidable by the martial institutions of Lycurgus; and having conquered Messina, and added its territory to their own, were justly esteemed the most powerful people in Greece. The other states of most consideration were Corinth, Thebes, Argos, and Arcadia. In Asia great revolutions had taken place. The ancient kingdom of Assyria was destroyed by the Medes and Babylonians, its capital city Ninevah utterly ruined, and the greatest part of its inhabitants carried to Babylon. Nay, the very materials of which it was built were carried off, to adorn and give strength to that stately metropolis, which was then undoubtedly the first city in the world. Nebuchadnezzar, a wise and valiant prince, now sat on the throne of Babylon. By him the kingdom of Judæa was totally overthrown in 587 B. C. Three years before this he had taken and razed the city of Tyre, and overrun all the kingdom of Egypt. He is even said by Josephus to have conquered Spain, and reigned there nine years, after which he abandoned it to the Carthaginians; but this seems by no means probable. The extent of the Babylonian empire is not certainly known: but from what is recorded of it we may conclude, that it was not at all inferior even in this respect to any that ever existed; as the scripture tells us it was superior in wealth to any of the succeeding ones. We know that it comprehended Phœnicia, Palestine, Syria, Babylonia, Media, and Persia, and not improbably India also; and from a consideration of this vast extent of territory, and the riches with which every one of these countries abounded, we may form some idea of the wealth and power of this monarch. When we consider also, that the whole strength of this mighty empire was employed in beautifying the metropolis, we cannot look upon the wonders of that city as related by Herodotus to be at all incredible. See BABYLON; and ARCHITECTURE, N° 13. As to what passed in the republic of Carthage about this time, we are quite in the dark; there being a chasm in its history for no less than 300 years.

17 Fourth period. History of the Babylonian empire.

4. The fourth general period of history, namely, from the end of the fabulous times to the conquest of Babylon by Cyrus, is very short, including no more than 31 years. This sudden revolution was occasioned by the misconduct of Evil-merodach, Nebuchadnezzar's son, even in his father's life-time. For having, in a great hunting match on occasion of his marriage, entered the country of the Medes, and some of his troops coming up at the same time to relieve the garrisons in those places, he joined them to those already with him, and without the least provocation began to plunder and lay waste the neighbouring country. This produced an immediate revolt, which quickly extended over all Media and Persia. The Medes, headed by Astyages and his son Cyaxares, drove back Evil-merodach and his party with great slaughter; nor doth it appear that they were afterwards reduced even by Nebuchadnezzar himself. The new empire continued daily to gather strength; and at last Cyrus, Astyages's grandson, a prince of great prudence and valour, being made generalissimo of the Median and Persian forces, took Babylon itself in the year 538 B. C. as related under the article BABYLON.

18 Of the Romans, Greeks, Lydians, and Persians.

During this period the Romans increased in power under the wise administration of their king Servius Tullius, who, though a pacific prince, rendered his people more formidable by a peace of 20 years than his predecessors had done by all their victories. The Greeks, even at this early period, began to interfere with the Persians, on account of the Ionians or Grecian colonies in Asia Minor. These had been subdued by Crœsus king of Lydia about the year 562, the time of Nebuchadnezzar's death. Whether the Lydians had been subdued by the Babylonish monarch or not, is not now to be ascertained; though it is very probable that they were either in subjection to him, or greatly awed by his power, as before his death nothing considerable was undertaken by them. It is indeed probable, that during the insanity of Nebuchadnezzar, spoken of by Daniel, the affairs of his kingdom would fall into confusion; and many of those princes whom he formerly retained in subjection would set up for themselves. Certain it is, however, that if the Babylonians did not regard Crœsus as their subject, they looked upon him to be a very faithful ally; insomuch that they celebrated an annual feast in commemoration of a victory obtained by him over the Scythians. After the death of Nebuchadnezzar, Crœsus subdued many nations in Asia Minor, and among the rest the Ionians, as already related. They were, however, greatly attached to his government; for though they paid him tribute, and were obliged to furnish him with some forces in time of war, they were yet free from all kind of oppression. When Cyrus therefore was proceeding in his conquests of different parts of the Babylonish empire, before he proceeded to attack the capital, the Ionians refused to submit to him, though he offered them very advantageous terms. But soon after, Crœsus himself being defeated and taken prisoner, the Ionians sent ambassadors to Cyrus, offering to to ſubmit on the terms which had formerly been propoſed. Theſe terms were now refuſed; and the Ionians, being determined to reſiſt, applied to the Spartans for aid. Though the Spartans at that time could not be prevailed upon to give their countrymen any aſſiſtance, they ſent ambaſſadors to Cyrus with a threatening meſſage; to which he returned a contemptuous anſwer, and then forced the Ionians to ſubmit at diſcretion, five years before the taking of Babylon. Thus commenced the hatred between the Greeks and Perſians; and thus we ſee, that in the two firſt great monarchies the ſeeds of their deſtruction were ſown even before the monarchies themſelves were eſtabliſhed. For while Nebuchadnezzar was raiſing the Babyloniſh empire to its utmoſt height, his ſon was deſtroying what his father built up; and at the very time when Cyrus was eſtabliſhing the Perſian monarchy, by his ill-timed ſeverity to the Greeks he made that warlike people his enemies, whom his ſucceſſors were by no means able to reſiſt, and who would probably have overcome Cyrus himſelf, had they united in order to attack him. The tranſactions of Africa during this period are almoſt entirely unknown; though we cannot doubt that the Carthaginians enriched themſelves by means of their commerce, which enabled them afterwards to attain ſuch a conſiderable ſhare of power.

19 Fifth general period. Hiſtory of the Jews, Babylonians, Egyptians, &c.

5. Cyrus having now become maſter of all the eaſt, the Aſiatic affairs continued for ſome time in a ſtate of tranquillity. The Jews obtained leave to return to their own country, rebuild their temple, and again eſtabliſh their worſhip, of all which an account is given in the ſacred writings, though undoubtedly they muſt have been in a ſtate of dependance on the Perſians from that time forward. Cambyſes the ſucceſſor of Cyrus added Egypt to his empire, which had either not ſubmitted to Cyrus, or revolted ſoon after his death. He intended alſo to have ſubdued the Carthaginians; but as the Phœnicians refuſed to ſupply him with ſhips to fight againſt their own countrymen, he was obliged to lay this deſign aſide.

In 517 B. C. the Babylonians finding themſelves grievouſly oppreſſed by their Perſian maſters, reſolved to ſhake off the yoke, and ſet up for themſelves. For this purpoſe, they took care to ſtore their city with all manner of proviſions; and when Darius Hyſtaſpes, then king of Perſia, advanced againſt them, they took the moſt barbarous method that can be imagined of preventing an unneceſſary conſumption of thoſe proviſions, which they had ſo carefully amaſſed. Having collected all the women, old men, and children, into one place, they ſtrangled them without diſtinction, whether wives, fathers, mothers, brothers, or ſiſters; every one being allowed to ſave only the wife he liked beſt, and a maid ſervant to do the work of the houſe. This cruel policy did not avail them: their city was taken by treachery (for it was impoſſible to take it by force); after which the king cauſed the walls of it to be beaten down from 200 to 50 cubits height, that their ſtrength might no longer give encouragement to the inhabitants to revolt. Darius then turned his arms againſt the Scythians; but finding that expedition turn out both tedious and unprofitable, he directed his courſe eaſtward, and reduced all the country as far as the river Indus. In the mean time, the Ionians revolted; and being aſſiſted by the Greeks, a war commenced between the two nations, which was not thoroughly extinguiſhed but by the deſtruction of the Perſian empire in 330 B. C. The Ionians, however, were for this time obliged to ſubmit, after a war of ſix years; and were treated with great ſeverity by the Perſians. The conqueſt of Greece itſelf was then projected: but the expeditions for that purpoſe ended moſt unfortunately for the Perſians, and encouraged the Greeks to make repriſals on them, in which they ſucceeded according to their utmoſt wiſhes; and had it only been poſſible for them to have agreed among themſelves, the downfal of the Perſian empire would have happened much ſooner than it did. See ATHENS, SPARTA, MACEDON, and PERSIA.

In 459 B. C. the Egyptans made an attempt to recover their liberty, but were reduced after a war of ſix years. In 413 B. C. they revolted a ſecond time: and being aſſiſted by the Sidonians, drew upon the latter that terrible deſtruction foretold by the prophets; while they themſelves were ſo thoroughly humbled, that they never after made any attempt to recover their liberty.

The year 403 B. C. proved remarkable for the revolt of Cyrus againſt his brother Artaxerxes Mnemon; in which, through his own raſhneſs, he miſcarried, and loſt his life at the battle of Cunaxa, in the province of Babylon. Ten thouſand Greek mercenaries, who ſerved in his army, made their way back into Greece, though ſurrounded on all ſides by the enemy, and in the heart of a hoſtile country. In this retreat they were commanded by Xenophon, who has received the higheſt praiſes on account of his conduct and military ſkill in bringing it to a happy concluſion. Two years after, the invaſions of Ageſilaus king of Sparta threatened the Perſian empire with total deſtruction; from which, however, it was relieved by his being recalled in order to defend his own country againſt the other Grecian ſtates; and after this the Perſian affairs continued in a more proſperous way till the time of Alexander.

20 Xenophon's retreat.

During all this time, the volatile and giddy temper of the Greeks, together with their enthuſiaſtic deſire of romantic exploits, were preparing fetters for themſelves, which indeed ſeemed to be abſolutely neceſſary to prevent them from deſtroying one another. A zeal for liberty was what they all pretended; but on every occaſion it appeared, that this love of liberty was only a deſire of dominion. No ſtate in Greece could bear to ſee another equal to itſelf; and hence their perpetual conteſts for pre-eminence, which could not but weaken the whole body, and render them an eaſy prey to an ambitious and politic prince, who was capable of taking advantage of thoſe diviſions. Being all equally impatient of reſtraint, they never could bear to ſubmit to any regular government; and hence their determinations were nothing but the deciſions of a mere mob, of which they had afterwards almoſt conſtantly reaſon to repent. Hence alſo their baſe treatment of thoſe eminent men whom they ought moſt to have honoured; as Miltiades, Ariſtides, Themiſtocles, Alcibiades, Socrates, Phocion, &c. The various tranſactions between the Grecian ſtates, though they make a very conſiderable figure in particular hiſtory, make none at all in a general ſketch of the hiſtory of the world. We ſhall therefore only obſerve, that in 404 B. C. the Athenian power was in a manner totally broken by the

21 Hiſtory of the Greeks.

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taking of their city by the Spartans. In 370 B. C. that of the Spartans received a severe check from the Thebans at the battle of Leuctra; and eight years after was still further reduced by the battle of Mantinea. Epaminondas the great enemy of the Spartans was killed; but this only proved a more speedy means of subjugating all the states to a foreign, and at that time despicable, power. The Macedonians, a barbarous nation, lying to the north of the states of Greece, were two years after the death of Epaminondas reduced to the lowest ebb by the Illyrians, another nation of barbarians in the neighbourhood. The king of Macedon being killed in an engagement, Philip his brother departed from Thebes, where he had studied the art of war under Epaminondas, in order to take possession of his kingdom. Being a man of great prudence and policy, he quickly settled his own affairs; vanquished the Illyrians; and being no stranger to the weakened situation of Greece, began almost immediately to meditate the conquest of it. The particulars of this enterprise are related under the article MACEDON: here it is sufficient to take notice, that by first attacking those he was sure he could overcome, by corrupting those whom he thought it dangerous to attack, by sometimes pretending to assist one state and sometimes another, and by imposing upon all as best served his turn, he at last put it out of the power of the Greeks to make any resistance, at least such as could keep him from gaining his end. In 338 B. C. he procured himself to be elected general of the Amphictyons, or council of the Grecian states, under pretence of settling some troubles at that time in Greece; but having once obtained liberty to enter that country with an army, he quickly convinced the states that they must all submit to his will. He was opposed by the Athenians and Thebans; but the intestine wars of Greece had cut off all her great men, and no general was now to be found capable of opposing Philip with success.

The king of Macedon, being now master of all Greece, projected the conquest of Asia. To this he was encouraged by the ill success which had attended the Persians in their expeditions against Greece, the successes of the Greeks in their invasions, and the retreat of the ten thousand under Xenophon. All these events showed the weakness of the Persians, their vast inferiority to the Greeks in military skill, and how easily their empire might be overthrown by a proper union among the states.

22
Conquest of Persia by Alexander.

Philip was preparing to enter upon his grand design, when he was murdered by some assassins. His son Alexander was possessed of every quality necessary for the execution of so great a plan; and his impetuosity of temper made him execute it with a rapidity unheard of either before or since. It must be confessed, indeed, that the Persian empire was now ripe for destruction, and could not in all probability have withstood an enemy much less powerful than Alexander. The Asiatics have in all ages been much inferior to the European nations in valour and military skill. They were now sunk in luxury and effeminacy; and what was worse, they seem at this period to have been seized with that infatuation and distraction of councils which scarce ever fails to be a forerunner of the destruction of any nation. The Persian ministers persuaded their sovereign to reject the prudent advice that was given him, of distressing Alexander by laying waste the country, and thus forcing him to return for want of provisions. Nay, they even prevented him from engaging the enemy in the most proper manner, by dividing his forces; and persuaded him to put Charidemus the Athenian to death, who had promised with 100,000 men, of whom one-third were mercenaries, to drive the Greeks out of Asia. In short, Alexander met with only two checks in his Persian expedition. The one was from the city of Tyre, which for seven months resisted his utmost efforts; the other was from Memnon the Rhodian, who had undertaken to invade Macedonia. The first of these obstacles Alexander at last got over, and treated the governor and inhabitants with the utmost cruelty. The other was scarce felt; for Memnon died after reducing some of the Grecian islands, and Darius had no other general capable of conducting the undertaking. The power of the Persian empire was totally broken by the victory gained over Darius at Arbela in 331 B. C. and next year a total end was put to it by the murder of the king by Bessus one of his subjects.

23
His conquest of other nations.

The ambition of Alexander was not to be satisfied with the possession of the kingdom of Persia, or indeed of any other on earth. Nothing less than the total subjection of the world itself seemed sufficient to him; and therefore he was now prompted to invade every country of which he could only learn the name, whether it had belonged to the Persians or not. In consequence of this disposition, he invaded and reduced Hyrcania, Bactria, Sogdia, and all that vast tract of country now called *Bukharia*. At last, having entered India, he reduced all the nations to the river Hyphasis, one of the branches of the Indus. But when he would have proceeded farther, and extended his conquests quite to the eastern extremities of Asia, his troops positively refused to follow him farther, and he was constrained to return. In 323 B. C. this mighty conqueror died of a fever; without having time to settle the affairs of his vast extended empire, or even to name his successor.

24
History of the Romans.

While the Grecian empire thus suddenly sprung up in the east, the rival states of Rome and Carthage were making considerable advances in the west. The Romans were establishing their empire on the most solid foundations; to which their particular situation naturally contributed. Being originally little better than a parcel of lawless banditti, they were despised and hated by the neighbouring states. This soon produced wars; in which, at first from accidental circumstances, and afterwards from their superior valour and conduct, the Romans proved almost constantly victorious. The jealousies which prevailed among the Italian states, and their ignorance of their true interest, prevented them from combining against that aspiring nation, and crushing it in its infancy, which they might easily have done; while in the mean time the Romans, being kept in a state of continual warfare, became at last such expert soldiers, that no other state on earth could resist them. During the time of their kings they had made a very considerable figure among the Italian nations; but after their expulsion, and the commencement of the republic, their conquests became much more rapid and extensive. In 501 B. C. they subdued the Sabines; eight years after, the Latins; and in 399 B. C. the city

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city of Veii, the strongest in Italy, exceeding Rome itself, was taken after a siege of ten years. But in the midst of their successes a sudden irruption of the Gauls had almost put an end to their power and nation at once. The city was burnt to the ground in 383 B. C. and the capitol on the point of being surprised, when the Gauls, who were climbing up the walls in the night, were accidentally discovered and repulsed *. In a short time Rome was rebuilt with much greater splendor than before, but now a general revolt and combination of the nations formerly subdued took place. The Romans, however, still got the better of their enemies; but, even at the time of the celebrated Camillus's death, which happened about 352 B. C. their territories scarce extended six or seven leagues from the capital. The republic from the beginning was agitated by those dissensions which at last proved its ruin. The people had been divided by Romulus into two classes, namely *Patricians* and *Plebeians*, answering to our nobility and commonalty. Between these two bodies were perpetual jealousies and contentions; which retarded the progress of the Roman conquests, and revived the hopes of the nations they had conquered. The tribunes of the people were perpetually opposing the consuls and military tribunes. The senate had often recourse to a dictator endowed with absolute power; and then the valour and experience of the Roman troops made them victorious; but the return of domestic seditions gave the subjugated nations an opportunity of shaking off the yoke. Thus had the Romans continued for near 400 years, running the same round of wars with the same enemies, and reaping very little advantage from their conquests, till at last matters were compounded by choosing one of the consuls from among the plebeians; and from this time chiefly we may date the prosperity of Rome, so that by the time that Alexander the Great died they were held in considerable estimation among foreign nations.

* See *Rome*.

25
Of the Carthaginians, and of Sicily.

The Carthaginians in the mean time continued to enrich themselves by commerce; but, being less conversant in military affairs, were by no means equal to the Romans in power, though they excelled them in wealth. A new state, however, makes its appearance during this period, which may be said to have taught the Carthaginians the art of war, and, by bringing them into the neighbourhood of the Romans, proved the first source of contention between these two powerful nations. This was the island of Sicily. At what time people were first settled on it, is not now to be ascertained. The first inhabitants we read of were called *Sicani*, *Siculi*, *Læstrigones*, &c. but of these we know little or nothing. In the second year of the 17th Olympiad, or 710 B. C. some Greek colonies are said to have arrived on the island, and in a short time founded several cities, of which Syracuse was the chief. The Syracusans at last subdued the original inhabitants: though it doth not appear that the latter were ever well affected to their government, and therefore were on all occasions ready to revolt. The first considerable prince, or (as he is called by the Greeks) *tyrant* of Syracuse, was Gelon, who obtained the sovereignty about the year 483 B. C. At what time the Carthaginians first carried their arms into Sicily is not certainly known; only we are assured, that they possessed some part of the island as early as 505 B. C. For in the time of the first consuls, the Romans and Carthaginians entered into a treaty chiefly in regard to matters of navigation and commerce; by which it was stipulated, that the Romans who should touch at Sardinia, or that part of Sicily which belonged to Carthage, should be received there in the same manner as the Carthaginians themselves. Whence it appears, that the dominion of Carthage already extended over Sardinia and part of Sicily: but in 28 years after, they had been totally driven out by Gelon; which probably was the first exploit performed by him. This appears from his speech to the Athenian and Spartan ambassadors who desired his assistance against the forces of Xerxes king of Persia. The Carthaginians made many attempts to regain their possessions in this island, which occasioned long and bloody wars between them and the Greeks, as related under the articles CARTHAGE and SICILY. This island also proved the scene of much slaughter and bloodshed in the wars of the Greeks with one another ‖. Before the year 323 B. C. however, the Carthagians had made themselves masters of a very considerable part of the island; from whence all the power of the Greeks could not dislodge them. It is proper also to observe, that after the destruction of Tyre by Alexander the Great, almost all the commerce in the western part of the world fell to the share of the Carthaginians. Whether they had at this time made any settlements in Spain is not known. It is certain, that they traded to that country for the sake of the silver, in which it was very rich; as they probably also did to Britain for the tin with which it abounded.

‖ See *Athens* and *Sparta*.

26
Sixth period. History of the Macedonian empire.

6. The beginning of the sixth period presents us with a state of the world entirely different from the preceding. We now behold all the eastern part of the world, from the confines of Italy to the river Indus, and beyond it, newly united into one vast empire, and at the same time ready to fall to pieces for want of a proper head; the western world filled with fierce and savage nations, whom the rival republics of Carthage and Rome were preparing to enslave as fast as they could. The first remarkable events took place in the Macedonian empire.—Alexander, as already observed, had not distinctly named any successor; but he had left behind him a victorious, and, we may say, invincible army, commanded by most expert officers, all of them ambitious of supreme authority. It is not to be supposed that peace could long be preserved in such a situation. For a number of years, indeed, nothing was to be seen or heard of but the most horrid slaughters, and wickedness of every kind, until at last the mother, wives, children, brothers, and even sisters, of Alexander were cut off; not one of the family of that great conqueror being left alive. When matters were a little settled, four new empires, each of them of no small extent, had arisen out of the empire of Alexander. Cassander, the son of Antipater, had Macedonia and all Greece; Antigonus, Asia Minor; Seleucus had Babylon and the eastern provinces; and Ptolemy Lagus, Egypt and the western ones. One of these empires, however, quickly fell; Antigonus being defeated and killed by Seleucus and Lysimachus at the battle of Ipsus, in 301 B. C. The greatest part of his dominions then fell to Seleucus; but several provinces

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vinces took the opportunity of these confusions to shake off the Macedonian yoke altogether: and thus were formed the kingdoms of Pontus, Bithynia, Pergamus, Armenia, and Cappadocia. The two most powerful and permanent empires, however, were those of Syria founded by Seleucus, and Egypt by Ptolemy Lagus. The kings of Macedon, though they did not preserve the same authority over the Grecian states that Alexander, Antipater, and Cassander, had done, yet effectually prevented them from those outrages upon one another, for which they had formerly been so remarkable. Indeed, it is somewhat difficult to determine, whether their condition was better or worse than before they were conquered by Philip; since, though they were now prevented from destroying one another, they were most grievously oppressed by the Macedonian tyrants.

While the eastern parts of the world were thus deluged with blood, and the successors of Alexander were pulling to pieces the empire which he had established, the Romans and Carthaginians proceeded in their attempts to enslave the nations of the west. The Romans, ever engaged in war, conquered one city and state after another, till about the year 253 B. C. they had made themselves masters of almost the whole of Italy. During all this time they had met only with a single check in their conquests, and that was the invasion of Pyrrhus, king of Epirus. That ambitious and fickle prince had projected the conquest of Italy, which he fancied would be an easy matter. Accordingly, in 271 B. C. he entered that country, and maintained a war with the Romans for six years, till at last, being utterly defeated by Curius Dentatus, he was obliged to return.

27 Of the Romans and Carthaginians.

The Romans had no sooner made themselves masters of Italy, than they wanted only a pretence to carry their arms out of it, and this pretence was soon found out. Being invited into Sicily to assist the Mamertines against Hiero king of Syracuse and the Carthaginians, they immediately commenced a war with the latter, which continued with the utmost fury for 23 years. The war ended greatly to the disadvantage of the Carthaginians, chiefly owing to the bad conduct of their generals, none of whom, Hamilcar Barcas alone excepted, seem to have been possessed of any degree of military skill; and the state had suffered too many misfortunes before he entered upon the command, for him or any other to retrieve it at that time. The consequence of this war was the entire loss of Sicily to the Carthaginians; and soon after, the Romans seized on the island of Sardinia.

Hamilcar perceiving that there was now no alternative, but that in a short time either Carthage must conquer Rome, or Rome would conquer Carthage, bethought himself of a method by which his country might become equal to that haughty republic. This was by reducing all Spain, in which the Carthaginians had already considerable possessions, and from the mines of which they drew great advantages. He had, therefore, no sooner finished the war with the mercenaries, which succeeded that with the Romans, than he set about the conquest of Spain. This, however, he did not live to accomplish, though he made great progress in it. His son Asdrubal continued the war with success; till at last the Romans, jealous of his progress, persuaded him to enter into a treaty with them, by which he engaged himself to make the river Iberus the boundary of his conquests. This treaty probably was never ratified by the senate of Carthage, nor, though it had, would it have been regarded by Hannibal, who succeeded Asdrubal in the command, and had sworn perpetual enmity with the Romans. The transactions of the second Punic war are perhaps the most remarkable which the history of the world can afford. Certain it is, that nothing can show more clearly the slight foundations upon which the greatest empires are built. We now see the Romans, the nation most remarkable for their military skill in the whole world, and who, for more than 500 years, had been constantly victorious, unable to resist the efforts of one single man. At the same time we see this man, though evidently the first general in the world, lost solely for want of a slight support. In former times, the republic of Carthage supplied her generals in Sicily with hundreds of thousands, though their enterprises were almost constantly unsuccessful; but now Hannibal, the conqueror of Italy, was obliged to abandon his design, merely for want of 20 or 30,000 men. That degeneracy and infatuation, which never fails to overwhelm a falling nation, or rather which is the cause of its fall, had now infected the counsels of Carthage, and the supplies were denied. Neither was Carthage the only infatuated nation at this time.—Hannibal, whose prudence never forsook him either in prosperity or adversity, in the height of his good fortune had concluded an alliance with Philip king of Macedon. Had that prince sent an army to the assistance of the Carthaginians in Italy immediately after the battle of Cannæ, there can be no doubt but the Romans would have been forced to accept of that peace which they so haughtily refused ‡; and indeed, this offer of peace, in the midst of so much success, is an instance of moderation which perhaps does more honour to the Carthaginian general than all the military exploits he performed. Philip, however, could not be roused from his indolence, nor see that his own ruin was connected with that of Carthage. The Romans had now made themselves masters of Sicily; after which they recalled Marcellus, with his victorious army, to be employed against Hannibal; and the consequence at last was, that the Carthaginian armies, unsupported in Italy, could not conquer it, but were recalled into Africa, which the Romans had invaded. The southern nations seem to have been as blind to their own interest as the northern ones. They ought to have seen, that it was necessary for them to preserve Carthage from being destroyed; but instead of this, Masinissa king of Numidia allied with the Romans, and by his means Hannibal was overcome at the battle of Zama *, which finished the second Punic war, in 188 B. C.

‡ See *Carthage*, N° 125.

* See *Zama*.

28 Of Egypt and Syria.

The event of the second Punic war determined the fate of almost all the other nations in the world. All this time, indeed, the empires of Egypt, Syria, and Greece, had been promoting their own ruin by mutual wars and intestine divisions. The Syrian empire was now governed by Antiochus the Great, who seems to have had little right to such a title. His empire, though diminished by the defection of the Parthians, was still very powerful; and to him Hannibal

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Hannibal applied, after he was obliged to leave his country, as related under CARTHAGE, N° 152. Antiochus, however, had not sufficient judgment to see the necessity of following that great man's advice; nor would the Carthaginians be prevailed upon to contribute their assistance against the nation which was soon to destroy them without any provocation. The pretence for war on the part of the Romans was, that Antiochus would not declare his Greek subjects in Asia to be free and independent states; a requisition which neither the Romans nor any other nation had a right to make. The event of all was, that Antiochus was everywhere defeated, and forced to conclude a peace upon very disadvantageous terms.

29 Of Greece.

In Europe, matters went on in the same way; the states of Greece, weary of the tyranny of the Macedonians, entered into a resolution of recovering their liberties. For this purpose was framed the Achæan League‡; but as they could not agree among themselves, they at last came to the imprudent determination of calling in the Romans to defend them against Philip king of Macedon. This produced a war, in which the Romans were victorious. The Macedonians, however, were still formidable; and as the intention of the Romans to enslave the whole world could no longer be doubted, Perseus, the successor of Philip, renewed the war. Through his own cowardice he lost a decisive engagement, and with it his kingdom, which submitted to the Romans in 167 B. C.

‡See *Greece*.

30 Destruction of Carthage and Corinth.

Macedon being thus conquered, the next step was utterly to exterminate the Carthaginians; whose republic, notwithstanding the many disasters that had befallen it, was still formidable. It is true, the Carthaginians were giving no offence; nay, they even made the most abject submissions to the republic of Rome: but all was not sufficient. War was declared a third time against that unfortunate state; there was now no Hannibal to command their armies, and the city was utterly destroyed 146 B. C. The same year the Romans put an end to the liberties they had pretended to grant the cities of Greece, by the entire destruction of CORINTH. See that article.

31 History of Egypt, Syria, and Judæa.

After the death of Antiochus the Great, the affairs of Syria and Egypt went on from bad to worse. The degenerate princes which filled the thrones of those empires, regarding only their own pleasures, either spent their time in oppressing their subjects, or in attempting to deprive each other of their dominions, by which means they became a more easy prey to the Romans. So far indeed were they from taking any means to secure themselves against the overgrown power of that republic, that the kings both of Syria and Egypt sometimes applied to the Romans as protectors. Their downfal, however, did not happen within the period of which we now treat.—The only other transaction which makes any considerable figure in the Syrian empire is the oppression of the Jews by Antiochus Epiphanes. After their return from the Babylonish captivity, they continued in subjection to the Persians till the time of Alexander.—From that time they were subject to the kings of Egypt or Syria, as the fortune of either happened to prevail. Egypt being reduced to a low ebb by Antiochus Epiphanes, the Jews fell under his dominion; and being severely treated by him, imprudently showed some signs of joy on a report of his death. This brought him against them with a powerful army; and in 170 B. C. he took Jerusalem by storm, committing the most horrid cruelties on the inhabitants, insomuch that they were obliged to hide themselves in caverns and in holes of rocks to avoid his fury Their religion was totally abolished, their temple profaned, and an image of Jupiter Olympius set up on the altar of burnt-offerings: which profanation is thought to be the *abomination of desolation* mentioned by the prophet Daniel. This revolution, however, was of no long continuance. In 167 B. C. Mattathias restored the true worship in most of the cities of Judea; and in 168 the temple was purified, and the worship there restored by Judas Maccabæus. This was followed by a long series of wars between the Syrians and Jews, in which the latter were almost always victorious; and before these wars were finished, the destruction of Carthage happened, which puts an end to the sixth general period formerly mentioned.

32 Seventh period. General state of the world.

7. The beginning of the seventh period presents us with a view of the ruins of the Greek empire in the declining states of Syria and Egypt; both of them much circumscribed in bounds. The empire of Syria at first comprehended all Asia to the river Indus, and beyond it; but in 312 B. C. most of the Indian provinces were by Seleucus ceded to one *Sandrocottus*, or *Androcottus*, a native, who in return gave him 500 elephants. Of the empire of Sandrocottus we know nothing farther than that he subdued all the countries between the Indus and the Ganges; so that from this time we may reckon the greatest part of India independent on the Syro-Macedonian princes. In 250 B. C. however, the empire sustained a much greater loss by the revolt of the Parthians and Bactrians from Antiochus Theus. The former could not be subdued; and as they held in subjection to them the vast tract which now goes under the name of *Persia*, we must look upon their defection as an irreparable loss. Whether any part of their country was afterwards recovered by the kings of Egypt or Syria, is not very certain; nor is it of much consequence, since we are assured that in the beginning of the seventh period, i. e. 146 B. C. the Greek empires of Syria and Egypt were reduced by the loss of India, Persia, Armenia, Pontus, Bithynia, Cappadocia, Pergamus, &c. The general state of the world in 146 B. C. therefore was as follows. In Asia were the empires of India, Parthia, and Syria, with the lesser states of Armenia, Pontus, &c. above mentioned; to which we must add that of Arabia, which during the sixth period had grown into some consequence, and had maintained its independency from the days of Ishmael the son of Abraham. In Africa were the kingdoms of Egypt and Ethiopia; the Carthaginian territories, now subject to the Romans; and the kingdoms of Numidia, Mauritania, and Getulia, ready to be swallowed up by the same ambitious and insatiable power, now that Carthage was destroyed, which served as a barrier against it. To the south lay some unknown and barbarous nations, secure by reason of their situation and insignificance, rather than their strength, or distance from Rome. In Europe we find none to oppose the progress of the Roman arms, except the Gauls, Ger-

mans,

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mans, and some Spanish nations. These were brave indeed; but through want of military skill, incapable of contending with such masters in the art of war as the Romans then were.

33 Conquests of the Romans.

The Spaniards had indeed been subdued by Scipio Africanus in the time of the second Punic war: but, in 155 B. C. they revolted; and, under the conduct of one Viriathus, formerly a robber, held out for a long time against all the armies the Romans could send into Spain. Him the consul Cæpio caused to be murdered about 138 B. C. because he found it impossible to reduce him by force. The city of Numantia defied the whole Roman power for six years longer; till at last, by dint of treachery, numbers, and perseverance, it was not taken, but the inhabitants, reduced to extremity by famine, set fire to their houses, and perished in the flames or killed one another, so that not one remained to grace the triumph of the conqueror: and this for the present quieted the rest of the Spaniards. About the same time Attalus, king of Pergamus, left by will the Roman people heirs to all his goods; upon which they immediately seized on his kingdom as part of those goods, and reduced it to a Roman province, under the name of *Asia Proper*. Thus they continued to enlarge their dominions on every side, without the least regard to justice, to the means they employed, or to the miseries they brought upon the conquered people. In 122 B. C. the Balearic islands, now called *Majorca*, *Minorca*, and *Ivica*, were subdued, and the inhabitants exterminated; and soon after, several of the nations beyond the Alps were obliged to submit.

In Africa the crimes of Jugurtha soon gave this ambitious republic an opportunity of conquering the kingdoms of Numidia and Mauritania: and indeed this is almost the only war in which we find the Romans engaged where their pretensions had the least colour of justice; though in no case whatever could a nation show more degeneracy than the Romans did on this occasion. The particulars of this war are related under the articles NUMIDIA and ROME. The event of it was the total reduction of the former about the year 105 B. C. but Mauritania and Getulia preserved their liberty for some time longer.

In the east, the empire of Syria continued daily to decline; by which means the Jews not only had an opportunity of recovering their liberty, but even of becoming as powerful, or at least of extending their dominions as far, as in the days of David and Solomon. This declining empire was still farther reduced by the civil dissensions between the two brothers Antiochus Grypus and Antiochus Cyzicenus; during which the cities of Tyre, Sidon, Ptolemais, and Gaza, declared themselves independent, and in other cities tyrants started up who refused allegiance to any foreign power. This happened about 100 B. C.; and 17 years after, the whole was reduced by Tigranes king of Armenia. On his defeat by the Romans, the latter reduced Syria to a province of their empire. The kingdom of Armenia itself, with those of Pontus, Cappadocia, and Bithynia, soon shared the same fate; Pontus, the most powerful of them all, being subdued about 64 B. C. The kingdom of Judea also was reduced under the same power much about this time. This state owed the loss of its liberty to the same cause that had ruined several others, namely, calling in the Romans as arbitrators between two contending parties. The two sons of Alexander Jannæus (Hyrcanus and Aristobulus) contended for the kingdom. Aristobulus, being defeated by the party of Hyrcanus, applied to the Romans. Pompey the Great, who acted as ultimate judge in this affair, decided it against Aristobulus, but at the same time deprived Hyrcanus of all power as a king; not allowing him even to assume the regal title, or to extend his territory beyond the ancient borders of Judea. To such a length did Pompey carry this last article, that he obliged him to give up all those cities in Cœlosyria and Phœnicia which had been gained by his predecessors, and added them to the newly acquired Roman province of Syria.

Thus the Romans became masters of all the eastern parts of the world, from the Mediterranean sea to the borders of Parthia. In the west, however, the Gauls were still at liberty, and the Spanish nations bore the Roman yoke with great impatience. The Gauls infested the territories of the republic by their frequent incursions, which were sometimes very terrible; and though several attempts had been made to subdue them, they always proved insufficient till the time of Julius Cæsar. By him they were totally reduced, from the river Rhine to the Pyrenæan mountains, and many of their nations almost exterminated. He carried his arms also into Germany and the southern parts of Britain; but in neither of these parts did he make any permanent conquests. The civil wars between him and Pompey gave him an opportunity of seizing on the kingdom of Mauritania and those parts of Numidia which had been allowed to retain their liberty. The kingdom of Egypt alone remained, and to this nothing belonged except the country properly so called. Cyrenaica was bequeathed by will to the Romans about 58 B. C.; and about the same time the island of Cyprus was seized by them without any pretence, except a desire of possessing the treasure of the king.— The kingdom of Egypt continued for some time longer at liberty; which in some measure must be ascribed to the internal dissensions of the republic, but more especially to the amours of Pompey, Julius Cæsar, and Mark Antony, with the famous Cleopatra queen of Egypt. The battle of Actium, however, determined the fate of Antony, Cleopatra, and Egypt itself; which last was reduced to a Roman province about 9 B. C.

34 Origin and progress of the civil wars in Rome.

While the Romans thus employed all means to reduce the world to their obedience, they were making one another feel the same miseries at home which they inflicted upon other nations abroad. The first civil dissensions took their rise at the siege of Numantia in Spain. We have already observed, that this small city resisted the whole power of the Romans for six years. Once they gave them a most terrible and shameful defeat, wherein 30,000 Romans fled before 4000 Numantines. Twenty thousand were killed in the battle, and the remaining ten thousand so shut up, that there was no possibility of escaping. In this extremity they were obliged to negociate with the enemy, and a peace was concluded upon the following terms: 1. That the Numantines should suffer the Romans to retire unmolested; and, 2. That Numantia should maintain

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maintain its independence, and be reckoned among the Roman allies.—The Roman senate, with an injustice and ingratitude hardly to be matched, broke this treaty, and in return ordered the commander of their army to be delivered up to the Numantines; but they refused to accept of him, unless his army was delivered along with him; upon which the war was renewed, and ended as already related. The fate of Numantia, however, was soon revenged. Tiberius Sempronius Gracchus, brother-in-law to Scipio Africanus the second, had been a chief promoter of the peace with the Numantines already mentioned, and of consequence had been in danger of being delivered up to them along with the commander in chief. This disgrace he never forgot; and, in order to revenge himself, undertook the cause of the plebeians against the patricians, by whom the former were greatly oppressed. He began with reviving an old law, which had enacted that no Roman citizen should possess more than 500 acres of land. The overplus he designed to distribute among those who had no lands, and to reimburse the rich out of the public treasury. This law met with great opposition, bred many tumults, and at last ended in the death of Gracchus and the persecution of his friends, several hundreds of whom were put to cruel deaths without any form of law.

The disturbances did not cease with the death of Gracchus. New contests ensued on account of the Sempronian law, and the giving to the Italian allies the privilege of Roman citizens. This last not only produced great commotions in the city, but occasioned a general revolt of the states of Italy against the republic of Rome. This rebellion was not quelled without the utmost difficulty; and in the mean time, the city was deluged with blood by the contending factions of Sylla and Marius; the former of whom sided with the patricians, and the latter with the plebeians. These disturbances ended in the perpetual dictatorship of Sylla, about 80 B. C.

From this time we may date the loss of the Roman liberty; for though Sylla resigned his dictatorship two years after, the succeeding contests between Cæsar and Pompey proved equally fatal to the republic. These contests were decided by the battle of Pharsalia, by which Cæsar became in effect master of the empire in 43 B. C. Without loss of time he then crossed over into Africa; totally defeated the republican army in that continent; and, by reducing the country of Mauritania to a Roman province, completed the Roman conquests in these parts. His victory over the sons of Pompey at Munda 40 B. C. secured him from any further apprehensions of a rival. Being therefore sole master of the Roman empire, and having all the power of it at his command, he projected the greatest schemes; tending, according to some, not less to the happiness than to the glory of his country: when he was assassinated in the senate-house, in the 56th year of his age, and 39 B. C.

Without investigating the political justice of this action, or the motives of the perpetrators, it is impossible not to regret the death of this great man, when we contemplate his virtues, and the designs which he is said to have formed: (See ROME). Nor is it possible to justify, from ingratitude at least, even the most virtuous of the conspirators, when we consider the obligations under which they lay to him. And as to the measure itself, even in the view of expediency, it seems to be generally condemned. In fact, from the transactions which had long preceded, as well as those which immediately followed, the murder of Cæsar, it is evident, that Rome was incapable of preserving its liberty any longer, and that the people had become unfit for being free. The efforts of Brutus and Cassius were therefore unsuccessful, and ended in their own destruction and that of great numbers of their followers in the battle of Philippi. The defeat of the republicans was followed by numberless disturbances, murders, proscriptions, &c. till at last Octavianus, having cut off all who had the courage to oppose him, and finally got the better of his rivals by the victory at Actium, put an end to the republic in the year 27 B. C.

35 Octavianus puts an end to the republic.

The destruction of the Roman commonwealth proved advantageous to the few nations of the world who still retained their liberty. That outrageous desire of conquest, which had so long marked the Roman character, now in a great measure ceased; because there was now another way of satisfying the desires of ambitious men, namely, by courting the favour of the emperor. After the final reduction of the Spaniards, therefore, and the conquest of the countries of Mæsia, Pannonia, and some others adjacent to the Roman territories, and which in a manner seemed naturally to belong to them, the empire enjoyed for some time a profound peace.

The only remarkable transactions which took place during the remainder of the period of which we treat, were the conquest of Britain by Claudius and Agricola, and the destruction of Jerusalem by Vespasian and Titus. The war with the Jews began A. D. 67; and was occasioned by their obstinately claiming the city of Cæsarea, which the Roman had added to the province of Syria. It ended in 73, with the most terrible destruction of their city and nation; since which time they have never been able to assemble as a distinct people. The southern parts of Britain were totally subdued by Agricola about ten years after.

In the 98th year of the Christian era, Trajan was created emperor of Rome; and being a man of great valour and experience in war, carried the Roman conquests to their utmost extent. Having conquered the Dacians, a German nation beyond the Danube, and who had of late been very troublesome, he turned his arms eastward; reduced all Mesopotamia, Chaldæa, Assyria; and having taken Ctesiphon, the capital of the Parthian empire, appointed them a king, which he thought would be a proper method of keeping that warlike people in subjection. After this he proposed to return to Italy, but died by the way; and with his reign the seventh general period above mentioned is concluded.

36 Eighth period. General state of the world.

8. The beginning of the eighth period presents us with a view of one vast empire, in which almost all the nations of the world were swallowed up. This empire comprehended the best part of Britain, all Spain, France, the Netherlands, Italy, part of Germany, Egypt, Barbary, Bildulgerid, Turkey in Europe, Turkey in Asia, and Persia. The state of India at this time is unknown. The Chinese lived in a remote part of the world, unheard-of and unmolested by the western nations

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nations who ſtruggled for the empire of the world. The northern parts of Europe and Aſia were filled with barbarous nations, already formidable to the Romans, and who were ſoon to become more ſo. The vaſt empire of the Romans, however, had no ſooner attained its utmoſt degree of power, than, like others before it, it began to decline. The provinces of Babylonia, Meſopotamia, and Aſſyria, almoſt inſtantly revolted, and were abandoned by Adrian the ſucceſſor of Trajan in the empire. The Parthians having recovered their liberty, continued to be very formidable enemies, and the barbarians of the northern parts of Europe continued to increaſe in ſtrength; while the Romans, weakened by inteſtine diviſions, became daily leſs able to reſiſt them. At different times, however, ſome warlike emperors aroſe, who put a ſtop to the incurſions of theſe barbarians; and about the year 215, the Parthian empire was totally overthrown by the Perſians, who had long been ſubject to them. This revolution proved of little advantage to the Romans. The Perſians were enemies ſtill more troubleſome than the Parthians had been; and though often defeated, they ſtill continued to infeſt the empire on the eaſt, as the barbarous nations of Europe did on the north. In 260, the defeat and captivity of the emperor Valerian by the Perſians, with the diſturbances which followed, threatened the empire with utter deſtruction. Thirty tyrants ſeized the government at once, and the barbarians pouring in on all ſides in prodigious numbers ravaged almoſt all the provinces of the empire. By the vigorous conduct of Claudius, Aurelian, Tacitus, Probus, and Carus, the empire was reſtored to its former luſtre; but as the barbarians were only repulſed, and never thoroughly ſubdued, this proved only a temporary relief. What was worſe, the Roman ſoldiers, grown impatient of reſtraint, commonly murdered thoſe emperors who attempted to revive among them the ancient military diſcipline, which alone could enſure them victory over their enemies. Under Diocleſian, the diſorders were ſo great, that though the government was held by two perſons, they found themſelves unable to bear the weight of it, and therefore took other two partners in the empire. Thus was the Roman empire divided into four parts; which by all hiſtorians is ſaid to have been productive of the greateſt miſchiefs. As each of theſe four ſovereigns would have as many officers both civil and military, and the ſame number of forces that had been maintained by the ſtate when governed only by one emperor, the people were not able to pay the ſums neceſſary for ſupporting them. Hence the taxes and impoſts were increaſed beyond meaſure, the inhabitants in ſeveral provinces reduced to beggary, the land left untilled for want of hands, &c. An end was put to theſe evils when the empire was again united under Conſtantine the Great; but in 330 a mortal blow was given it, by removing the imperial ſeat to Byzantium, now Conſtantinople, and making it equal to Rome. The introduction and eſtabliſhment of Chriſtianity, already corrupted with the groſſeſt ſuperſtitions, proved alſo a moſt grievous detriment to the empire. Inſtead of that ferocious and obſtinate valour in which the Romans had ſo long been accuſtomed to put their truſt, they now imagined themſelves ſecured by ſigns of the croſs, and other external ſymbols of the Chriſtian religion. Theſe they uſed as a kind of magical incantations, which undoubtedly proved at all times ineffectual; and hence alſo in ſome meaſure proceeded the great revolution which took place in the next period.

37 Ninth period. Deſtruction of the weſtern empire.

9. The ninth general period ſhows us the decline and miſerable end of the weſtern part of the Roman empire. We ſee that mighty empire, which formerly occupied almoſt the whole world, now weakened by diviſion, and ſurrounded by enemies. On the eaſt, the Perſians; on the north, the Scythians, Sarmatians, Goths, and a multitude of other barbarous nations, watched all occaſions to break into it; and miſcarried in their attempts, rather through their own barbarity, than the ſtrength of their enemies. The devaſtations committed by thoſe barbarians when they made their incurſions are incredible, and the relation ſhocking to human nature. Some authors ſeem much inclined to favour them; and even inſinuate, that barbarity and ignorant ferocity were their chief if not their only faults: but from their hiſtory it plainly appears, that not only barbarity and the moſt ſhocking cruelty, but the higheſt degrees of avarice, perfidy, and diſregard to the moſt ſolemn promiſes, were to be numbered among their vices. It was ever a ſufficient reaſon for them to make an attack, that they thought their enemies could not reſiſt them. Their only reaſon for making peace, or for keeping it, was becauſe their enemies were too ſtrong: and their only reaſon for committing the moſt horrid maſſacres, rapes, and all manner of crimes, was becauſe they had gained a victory. The Romans, degenerate as they were, are yet to be eſteemed much better than theſe ſavages; and therefore we find not a ſingle province of the empire that would ſubmit to the barbarians while the Romans could poſſibly defend them.

Some of the Roman emperors indeed withſtood this inundation of ſavages; but as the latter grew daily more numerous, and the Romans continued to weaken themſelves by their inteſtine diviſions, they were at laſt obliged to take large bodies of barbarians into their pay, and teach them their military diſcipline, in other to drive away their countrymen, or others who invaded the empire. This at laſt proved its total deſtruction; for, in 476, the barbarians who ſerved in the Roman armies, and were dignified with the title of *allies*, demanded the third part of the lands of Italy as a reward for their ſervices: but meeting with a refuſal, they revolted, and made themſelves maſters of the whole country, and of Rome itſelf, which from that time ceaſed to be the head of an empire of any conſequence.

38 General ſtate of the world.

This period exhibits a moſt unfavourable view of the weſtern parts of the world: The Romans, from the height of grandeur, ſunk to the loweſt ſlavery, nay, in all probability, almoſt exterminated; the provinces they formerly governed, inhabited by human beings ſcarce a degree above the brutes; every art and ſcience loſt; and the ſavage conquerors even in danger of ſtarving for want of a ſufficient knowledge of agriculture, having now no means of ſupplying themſelves by plunder and robbery as before. Britain had long been abandoned to the mercy of the Scots and Picts; and in 450 the inhabitants had called in the Saxons to their aſſiſtance, whom they ſoon found worſe enemies than thoſe againſt whom they had implored

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plored their aid. Spain was held by the Goths and Suevians; Africa (that is, Barbary and Bildulgerid) by the Vandals; the Burgundians, Goths, Franks, and Alans, had erected several small states in Gaul; and Italy was subjected to the Heruli under Odoacer, who had taken upon him the title of *king of Italy*. In the east, indeed, matters wore an aspect somewhat more agreeable. The Roman empire continued to live in that of Constantinople, which was still very extensive. It comprehended all Asia Minor and Syria, as far as Persia; in Africa, the kingdom of Egypt; and Greece in Europe. The Persians were powerful, and rivalled the emperors of Constantinople; and beyond them lay the Indians, Chinese, and other nations, who, unheard-of by the inhabitants of the more western parts, enjoyed peace and liberty.

The Constantinopolitan empire continued to decline by reason of its continual wars with the Persians, Bulgarians, and other barbarous nations; to which also superstition and relaxation of military discipline largely contributed. The Persian empire also declined from the same causes, together with the intestine broils from which it was seldom free more than that of Constantinople. The history of the eastern part of the world during this period, therefore, consists only of the wars between these two great empires, of which an account is given under the articles CONSTANTINOPLE and PERSIA; and which were productive of no other consequence than that of weakening them both, and making them a more easy prey to those enemies who were now as it were in embryo, but shortly about to erect an empire almost as extensive as that of the Greeks or Romans.

39 History of Italy.

Among the western nations, revolutions, as might naturally be expected from the character of the people, succeeded one another with rapidity. The Heruli under Odoacer were driven out by the Goths under Theodoric. The Goths were expelled by the Romans; and, while the two parties were contending, both were attacked by the Franks, who carried off an immense booty. The Romans were in their turn expelled by the Goths: the Franks again invaded Italy, and made themselves masters of the province of Venetia; but at last the superior fortune of the emperor of Constantinople prevailed, and the Goths were finally subdued in 553. Narses, the conqueror of the Goths, governed Italy as a province of the eastern empire till the year 568, when Longinus his successor made considerable alterations. The Italian provinces had ever since the time of Constantine the Great been governed by *consulares*, *correctores*, and *præsides*; no alteration having been made either by the Roman emperors, or the Gothic kings. But Longinus, being invested with absolute power by Justinian, suppressed those magistrates; and, instead of them, placed in each city of note a governor, whom he distinguished with the title of *duke*. The city of Rome was not more honoured than any other; for Longinus, having abolished the very name of *senate* and *consuls*, appointed a *duke* of Rome as well as of other cities. To himself he assumed the title of *exarch*; and, residing at Ravenna, his government was styled the *exarchate of Ravenna*. But while he was establishing this new empire, the greatest part of Italy was conquered by the Lombards.

40 Of France.

In France a considerable revolution also took place. In 487, Clovis, the founder of the French monarchy, possessed himself of all the countries lying between the Rhine and the Loire. By force or treachery, he conquered all the petty kingdoms which had been erected in that country. His dominions had been divided, reunited, and divided again; and were on the point of being united a second time, when the great impostor Mahomet began to make a figure in the world.

41 Of Spain.

In Spain, the Visigoths erected a kingdom ten years before the conquest of Rome by the Heruli. This kingdom they had extended eastward, about the same time that Clovis was extending his conquests to the west; so that the two kingdoms met at the river Loire. The consequence of this approach of such barbarous conquerors towards each other was an immediate war. Clovis proved victorious, and subdued great part of the country of the Visigoths, which put a final stop to their conquests on that side.

Another kingdom had been founded in the western parts of Spain by the Suevi, a considerable time before the Romans were finally expelled from that country. In 409 this kingdom was entirely subverted by Theodoric king of the Goths; and the Suevi were so pent up in a small district of Lusitania and Galicia, that it seemed impossible for them to recover themselves. During the above-mentioned period, however, while the attention of the Goths was turned another way, they had found means again to erect themselves into an independent state, and to become masters of considerably extended territories. But this success proved of short duration. In 584 the Goths attacked them; totally destroyed their empire a second time; and thus became masters of all Spain, except some small part which still owned subjection to the emperors of Constantinople. Of this part, however, the Goths became masters also in the year 623; which concludes the 9th general period.

42 Of Africa.

Africa, properly so called, had changed its masters three times during this period. The Vandals had expelled the Romans, and erected an independent kingdom, which was at last overturned by the emperors of Constantinople; and from them the greatest part of it was taken by the Goths in 620.

43 Tenth general period. Conquests of the Saracens.

10. At the commencement of the tenth general period (which begins with the flight of Mahomet in the year 622, from whence his followers date their era called the *Hegira*), we see every thing prepared for the great revolution which was now to take place: the Roman empire in the west annihilated; the Persian empire and that of Constantinople weakened by mutual wars and intestine divisions; the Indians and other eastern nations unaccustomed to war, and ready to fall a prey to the first invader; the southern parts of Europe in a distracted and barbarous state; while the inhabitants of Arabia, from their earliest origin accustomed to war and plunder, and now united by the most violent superstition and enthusiastic desire of conquest, were like a flood pent up, and ready to overwhelm the rest of the world.—The northern nations of Europe and Asia, however formidable in after-times, were at present unknown, and peaceable, at least with respect to their southern neighbours; so that there was in no quarter of the globe any power capable of opposing the conquests of the Arabs. With

amazing

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amazing celerity, therefore, they overran all Syria, Palestine, Persia, Bukharia, and India, extending their conquests farther to the eastward than ever Alexander had done. On the west side, their empire extended over Egypt, Barbary, and Spain, together with the islands of Sicily, Sardinia, Majorca, Minorca, &c. and many of the Archipelago islands; nor were the coasts of Italy itself free from their incursions; nay, they are even said to have reached the distant and barren country of Iceland. At last this great empire, as well as others, began to decline. Its ruin was very sudden, and owing to its internal divisions. Mahomet had not taken care to establish the apostleship in his family, or to give any particular directions about a successor. The consequence of this was, that the caliphate, or succession to the apostleship, was seized by many usurpers in different parts of the empire; while the true caliphs, who resided at Bagdad, gradually lost all power, and were regarded only as a kind of high-priests. Of these divisions the Turks took advantage to establish their authority in many provinces of the Mohammedan empire; but as they embraced the same religion with the Arabs, and were filled with the same enthusiastic desire of conquest, it is of little consequence to distinguish between them; as indeed it signified little to the world in general whether the Turks or Saracens were the conquerors, since both were cruel, barbarous, ignorant, and superstitious.

44 Of the Pope's temporal power.

While the barbarians of the east were thus grasping at the empire of the whole world, great disturbances happened among the no less barbarous nations of the west. Superstition seems to have been the ruling motive in both cases. The Saracens and Turks conquered for the glory of God, or of his apostle Mahomet and his successors; the western nations professed an equal regard for the divine glory, but which was only to be perceived in the respect they paid to the pope and clergy. Ever since the establishment of Christianity by Constantine, the bishops of Rome had been gradually extending their power; and attempting not only to render themselves independent, but even to assume an authority over the emperors themselves. The destruction of the empire was so far from weakening their power, that it afforded them opportunities of greatly extending it, and becoming judges of the sovereigns of Italy themselves, whose barbarity aud ignorance prompted them to submit to their decisions. All this time, however, they themselves had been in subjection to the emperors of Constantinople; but on the decline of that empire, they found means to get themselves exempted from this subjection. The principal authority in the city of Rome was then engrossed by the bishop; though of right it belonged to the duke appointed by the exarch of Ravenna. But though they had now little to fear from the eastern emperors, they were in great danger from the ambition of the Lombards, who aimed at the conquest of all Italy. This aspiring people the bishops of Rome determined to check; and therefore, in 726, when Luitprand king of the Lombards had taken Ravenna and expelled the exarch, the pope undertook to restore him. For this purpose he applied to the Venetians, who are now first mentioned in history as a state of any consequence; and by their means the exarch was restored. Some time before, a quarrel had happened between the pope (Gregory II.) and Leo emperor of the east, about the worship of images. Leo, who it seems, in the midst of so much barbarism, had still preserved some share of common sense and reason, reprobated the worship of images in the strongest terms, and commanded them to be destroyed throughout his dominions. The pope, whose cause was favoured by the most absurd superstitions, and by these only, refused to obey the emperor's commands. The exarch of Ravenna, as a subject of the emperor, was ordered to force the pope to a compliance, and even to seize or assassinate him in case of a refusal. This excited the pious zeal of Luitprand to assist the pope, whom he had formerly designed to subdue: the exarch was first excommunicated, and then torn in pieces by the enraged multitude: the duke of Naples shared the same fate; and a vast number of the *Iconoclasts*, or Image-breakers, as they were called, were slaughtered without mercy: and to complete all, the subjects of the exarchate, at the instigation of the pope, renounced their allegiance to the emperor.

Leo was no sooner informed of this revolt than he ordered a powerful army to be raised, in order to reduce the rebels, and take vengeance on the pope. Alarmed at these warlike preparations, Gregory looked round for some power on which he might depend for protection. The Lombards were possessed of sufficient force, but they were too near and too dangerous neighbours to be trusted; the Venetians, though zealous Catholics, were as yet unable to withstand the force of the empire; Spain was overrun by the Saracens: the French seemed, therefore, the only people to whom it was advisable to apply for aid; as they were able to oppose the emperor, and were likewise enemies to his edict. Charles Martel, who at that time governed France as mayor of the palace, was therefore applied to; but before a treaty could be concluded, all the parties concerned were removed by death. Constantine Copronymus, who succeeded Leo at Constantinople, not only persisted in the opposition to image-worship begun by his predecessor, but prohibited also the invocation of saints. Zachary, who succeeded Gregory III. in the pontificate, proved as zealous an adversary as his predecessor. Pepin, who succeeded Charles Martel in the sovereignty of France, proved as powerful a friend to the pope as his father had been. The people of Rome had nothing to fear from Constantinople; and therefore drove out all the emperor's officers. The Lombards, awed by the power of France, for some time allowed the pope to govern in peace the dominions of the exarchate; but in 752, Astolphus king of Lombardy not only reduced the greatest part of the pope's territories, but threatened the city of Rome itself. Upon this an application was made to Pepin, who obliged Astolphus to restore the places he had taken, and gave them to the pope, or, as he said, to St Peter. The Greek emperor to whom they of right belonged, remonstrated to no purpose. The pope from that time became possessed of considerable territories in Italy; which, from the manner of their donation, go under the name of *St Peter's Patrimony*. It was not, however, before the year 774 that the pope was fully secured in these new dominions. This was accomplished when the kingdom of the Lombards was totally destroyed by

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by Charlemagne, who was thereupon crowned king of Italy. Soon after, this monarch made himself master of all the Low Countries, Germany, and part of Hungary; and in the year 800, was solemnly crowned by the pope emperor of the west.

45 General state of the world.

Thus was the world once more divided into three great empires. The empire of the Arabs or Saracens extended from the river Ganges to Spain; comprehending almost all of Asia and Africa which has ever been known to Europeans, the kingdoms of China and Japan excepted. The eastern Roman empire was reduced to Greece, Asia Minor, and the provinces adjoining to Italy. The empire of the west, under Charlemagne, comprehended France, Germany, and the greatest part of Italy. The Saxons, however, as yet possessed Britain unmolested by external enemies, though the seven kingdoms erected by them were engaged in perpetual contests. The Venetians also enjoyed a nominal liberty; though it is probable that their situation would render them very much dependent on the great powers which surrounded them. Of all nations on earth, the Scots and Picts, and the remote ones of China and Japan, seem to have enjoyed, from their situation, the greatest share of liberty; unless, perhaps, we except the Scandinavians, who, under the names of *Danes* and *Normans*, were soon to infest their southern neighbours. But of all the European potentates, the popes certainly exercised the greatest authority; since even Charlemagne himself submitted to accept the crown from their hands, and his successors made them the arbiters of their differences.

Matters, however, did not long continue in this state. The empire of Charlemagne was on the death of his son Lewis divided among his three children. Endless disputes and wars ensued among them, till at last the sovereign power was seized by Hugh Capet in 987. The Saxon heptarchy was dissolved in 827, and the whole kingdom of England reduced under one head. The Danes and Normans began to make depredations, and infest the neighbouring states. The former conquered the English Saxons, and seized the government, but were in their turn expelled by the Normans in 1066. In Germany and Italy the greatest disturbances arose from the contests between the popes and the emperors. To all this if we add the internal contests which happened through the ambition of the powerful barons of every kingdom, we can scarce form an idea of times more calamitous than those of which we now treat. All Europe, nay, all the world, was one great field of battle; for the empire of the Mahometans was not in a more settled state than that of the Europeans. Caliphs, sultans, emirs, &c. waged continual war with each other in every quarter; new sovereignties every day sprung up, and were as quickly destroyed. In short, through the ignorance and barbarity with which the whole world was overspread, it seemed in a manner impossible that the human race could long continue to exist; when happily the crusades, by directing the attention of the Europeans to one particular object, made them in some measure suspend their slaughters of one another.

46 Eleventh period. The crusades.

II. The crusades originated from the superstition of the two grand parties into which the world was at that time divided, namely, the Christians and Mahometans. Both looked upon the small territory of Palestine, which they called the *Holy Land*, to be an invaluable acquisition, for which no sum of money could be an equivalent; and both took the most unjustifiable methods to accomplish their desires. The superstition of Omar the second caliph had prompted him to invade this country, part of the territories of the Greek emperor, who was doing him no hurt; and now when it had been so long under the subjection of the Mahometans, a similar superstition prompted the pope to send an army for the recovery of it. The crusaders accordingly poured forth in multitudes, like those with which the kings of Persia formerly invaded Greece; and their fate was pretty similar. Their impetuous valour at first, indeed, carried every thing before them: they recovered all Palestine, Phœnicia, and part of Syria, from the infidels; but their want of conduct soon lost what their valour had obtained, and very few of that vast multitude which had left Europe ever returned to their native countries. A second, a third, and several other crusades, were preached, and were attended with a like success in both respects: vast numbers took the cross, and repaired to the Holy Land; which they polluted with the most abominable massacres and treacheries, and from which very few of them returned. In the third crusade Richard I. of England was embarked, who seems to have been the best general that ever went into the east: but even his valour and skill were not sufficient to repair the faults of his companions; and he was obliged to return even after he had entirely defeated his antagonists, and was within sight of Jerusalem.

47 Conquests of the Moguls.

But while the Christians and Mahometans were thus superstitiously contending for a small territory in the western parts of Asia, the nations in the more easterly parts were threatened with total extermination. Jenghiz Khan, the greatest as well as the most bloody conqueror that ever existed, now makes his appearance. The rapidity of his conquests seemed to emulate those of Alexander the Great; and the cruelties he committed were altogether unparalleled. It is worth observing, that Jenghiz Khan and all his followers were neither Christians nor Mahometans, but strict deists. For a long time even the sovereign had not heard of a temple, or any particular place on earth appropriated by the deity to himself, and treated the notion with ridicule when it was first mentioned to him.

The Moguls, over whom Jenghiz Khan assumed the sovereignty, were a people of East Tartary, divided into a great number of petty governments as they are at this day, but who owned a subjection to one sovereign, whom they called *Vang Khan*, or the Great Khan. Temujin, afterwards *Jenghiz Khan*, was one of these petty princes; but unjustly deprived of the greatest part of his inheritance at the age of 13, which he could not recover till he arrived at that of 40. This corresponds with the year 1201, when he totally reduced the rebels; and as a specimen of his lenity caused 70 of their chiefs to be thrown into as many caldrons of boiling water. In 1202, he defeated and killed Vang Khan himself (known to the Europeans by the name of *Prester John of Asia*); and possessing himself of his vast dominions, became from thenceforward altogether irresistible. In 1206, having still continued to enlarge his dominions, he was declared khan of the Moguls and Tartars;

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Tartars; and took upon him the title of *Jenghiz Khan*, or *The most Great Khan of khans*. This was followed by the reduction of the kingdom of Hya in China, Tangut, Kitay, Turkestan, Karazm (the kingdom of Gazna founded by Mahmud Gazni), Great Bukharia, Persia, and part of India; and all these vast regions were reduced in 26 years. The devastations and slaughters with which they were accomplished are unparalleled, no fewer than 14,470,000 persons being computed to have been massacred by Jenghiz Khan during the last 22 years of his reign. In the beginning of 1227 he died, thereby freeing the world from a most bloody tyrant. His successors completed the conquest of China and Korea; but were foiled in their attempts on Cochin-China, Tong-king, and Japan. On the western side the Tartar dominions were not much enlarged till the time of Hulaku, who conquered Media, Babylonia, Mesopotamia, Assyria, Syria, Georgia, Armenia, and almost all Asia Minor; putting an end to the empire of the Saracens by the taking of Bagdad in 1258.

The empire of Jenghiz Khan had the fate of all others. Being far too extensive to be governed by one head, it split into a multitude of small kingdoms, as it had been before his time. All these princes, however, owned allegiance to the family of Jenghiz Khan till the time of Timur Bek, or Tamerlane. The Turks, in the mean time, urged forward by the inundation of Tartars who poured in from the east, were forced upon the remains of the Greek empire; and at the time of Tamerlane above mentioned, they had almost confined this once mighty empire within the walls of Constantinople.

48 Of Tamerlane.

In the year 1335, the family of Jenghiz Khan becoming extinct in Persia, a long civil war ensued; during which Timur Bek, one of the petty princes among which the Tartar dominions were divided, found means to aggrandize himself in a manner similar to what Jenghiz Khan had done about 150 years before. Jenghiz Khan, indeed, was the model whom he proposed to imitate; but it must be allowed that Timur was more merciful than Jenghiz Khan, if indeed the word can be applied to such inhuman tyrants. The plan on which Jenghiz Khan conducted his expeditions was that of total extermination. For some time he utterly extirpated the inhabitants of those places which he conquered, designing to people them anew with his Moguls; and in consequence of this resolution, he would employ his army in beheading 100,000 prisoners at once. Timur's cruelty, on the other hand, seldom went farther than the pounding of 3000 or 4000 people in large mortars, or building them among bricks and mortar into a wall. We must observe, however, that Timur was not a deist, but a Mahometan, and conquered expresly for the purpose of spreading the Mahometan religion; for the Moguls had now adopted all the superstitions and absurdities of Mahomet. Thus was all the eastern quarter of the world threatened anew with the most dreadful devastations, while the western nations were exhausting themselves in fruitless attempts to regain the Holy Land. The Turks were the only people who seem at this period to have been gathering strength, and by their perpetual encroachments threatened to swallow up the western nations as the Tartars had done the eastern ones.

In 1362, Timur invaded Bukharia, which he reduced in five years. He proceeded in his conquests, though not with the same celerity as Jenghiz Khan, till the year 1387, when he had subdued all Persia, Armenia, Georgia, Karazm, and great part of Tartary. After this he proceeded westward, subduing all the countries to the Euphrates; made himself master of Bagdad; and even entered Russia, where he pillaged the city of Moscow. From thence he turned his arms to the east, and totally subdued India. In 1393, he invaded and reduced Syria; and having turned his arms against the Turks, forced their sultan Bajazet to raise the siege of Constantinople. This brought on an engagement, in which Bajazet was entirely defeated and taken prisoner; which broke the power of the Turks to such a degree, that they were not for some time able to recover themselves. At last this great conqueror died in the year 1405, while on his way to conquer China, as Jenghiz Khan had done before him.

49 State of the world since that time.

The death of Timur was followed almost immediately by the dissolution of his empire. Most of the nations he had conquered recovered their liberty. The Turks had now no further obstacle to their conquest of Constantinople. The western nations having exhausted themselves in the *holy wars*, as they were called, had lost that insatiable thirst after conquest which for so long time possessed the minds of men. They had already made considerable advances in civilization, and began to study the arts of peace. Gunpowder was invented, and its application to the purposes of war already known; and, though no invention threatened to be more destructive, perhaps none was ever more beneficial to the human race. By the use of fire-arms, nations are put more on a level with each other than formerly they were; war is reduced to a regular system, which may be studied with as much success as any other science. Conquests are not now to be made with the same ease as formerly; and hence the last ages of the world have been much more quiet and peaceable than the former ones. In 1453, the conquest of Constantinople by the Turks fixed that wandering people to one place; and though now they possess very large regions both in Europe, Asia, and Africa, an effectual stop hath long been put to their further progress.

About this time, also, learning began to revive in Europe, where it had been long lost; and the invention of printing, which happened about the same time, rendered it in a manner impossible for barbarism ever to take place in such a degree as formerly. All nations of the world, indeed, seem now at once to have laid aside much of their former ferocity; and, though wars have by no means been uncommon, they have not been carried on with such circumstances of fury and savage cruelty as before. Instead of attempting to enrich themselves by plunder, and the spoils of their neighbours, mankind in general have applied themselves to commerce, the only true and durable source of riches. This soon produced improvements in navigation; and these improvements led to the discovery of many regions formerly unknown. At the same time, the European-

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ropean powers, being at laſt thoroughly ſenſible that extenſive conqueſts could never be permanent, applied themſelves more to provide for the ſecurity of thoſe dominions which they already poſſeſſed, than to attempt the conqueſt of one another: and this produced the policy to which ſo much attention was lately paid, namely, the *preſerving of the balance of Europe;* that is, preventing any one of the nations from acquiring ſufficient ſtrength to overpower another.

In the end of the 15th century, the vaſt continent of America was diſcovered; and, almoſt at the ſame time, the paſſage to the Eaſt Indies by the Cape of Good Hope. The diſcovery of theſe rich countries gave a new turn to the ambition of the Europeans. To enrich themſelves, either by the gold and ſilver produced in theſe countries, or by traffic with the natives, now became the object. The Portugueſe had the advantage of being the firſt diſcoverers of the eaſtern, and the Spaniards of the weſtern countries. The former did not neglect ſo favourable an opportunity of enriching themſelves by commerce. Many ſettlements were formed by them in the Eaſt India iſlands, and on the continent; but their avarice and perfidious behaviour towards the natives proved at laſt the cauſe of their total expulſion. The Spaniards enriched themſelves by the vaſt quantities of the precious metals imported from America, which were not obtained but by the moſt horrid maſſacres committed on the natives, and of which an account is given under the different names of the American countries. Theſe poſſeſſions of the Spaniards and Portugueſe ſoon excited other European nations to make attempts to ſhare with them in their treaſures, by planting colonies in different parts of America, and making ſettlements in the Eaſt Indies: and thus has the rage of war in ſome meaſure been transferred from Europe to theſe diſtant regions; and, after various conteſts, the Britiſh at laſt obtained a great ſuperiority both in America and the Eaſt Indies.

In Europe the only conſiderable revolutions which happened during this period, were, The total expulſion of the Moors and Saracens from Spain, by the taking of Grenada in 1491; the union of the kingdoms of Arragon and Caſtile, by the marriage of Ferdinand and Iſabella; and the revolt of the ſtates of Holland from the Spaniards. After much contention and bloodſhed, theſe laſt obtained their liberty, and were declared a free people in 1609; ſince which time they have continued an independent and very conſiderable nation of Europe.

In Aſia nothing of importance hath happened ſince the taking of Conſtantinople by the Turks. That continent is now divided among the following nations. The moſt northerly part, called *Siberia*, extending to the very extremity of the continent, is under the power of Ruſſia. To the ſouthward, from Aſia Minor to China and Korea, are the Tartars, formidable indeed from their numbers, but, by reaſon of their barbarity and want of union, incapable of attempting any thing. The Turks poſſeſs the weſtern part of the continent, called *Aſia Minor*, to the river Euphrates. The Arabs are again confined within their own peninſula; which they poſſeſs, as they have ever done, without owning ſubjection to any foreign power. To the eaſt of Turkey in Aſia lies Perſia, now more confined in its limits than before; and to the eaſtward of Perſia lies India, or the kingdom late of the Mogul, comprehending all the country from the Indus to the Ganges, and beyond that river. Still farther to the eaſt lie the kingdoms of Siam, Pegu, Thibet, and Cochin-China, little known to the Europeans. The vaſt empire of China occupies the moſt eaſterly part of the continent; while that of Japan comprehends the iſlands which go by that name, and which are ſuppoſed to lie at no great diſtance from the weſtern coaſts of America.

In Africa the Turks poſſeſs Egypt, which they conquered in 1517, and have a nominal juriſdiction over the ſtates of Barbary. The interior parts are filled with barbarous and unknown nations, as they have always been. On the weſtern coaſts are many ſettlements of the European nations, particularly the Britiſh and Portugueſe; and the ſouthern extremity is poſſeſſed by the Dutch. The eaſtern coaſts are almoſt totally unknown. The Aſiatic and African iſlands are either poſſeſſed by the Europeans, or inhabited by ſavage nations.

The European nations at the beginning of the 17th century were Sweden, Muſcovy, Denmark, Poland, Britain, Germany, Holland, France, Spain, Portugal, Italy, and Turkey in Europe. Of theſe the Ruſſians, though the moſt barbarous, were by far the moſt conſiderable, both in regard to numbers and the extent of their empire; but their ſituation made them little feared by the others, who lay at a diſtance from them. The kingdom of Poland, which was firſt ſet up in the year 1000, proved a barrier between Ruſſia and Germany; and at the ſame time the policy abovementioned, of keeping up the balance of power in Europe, rendered it probable that no one European nation, whatever wars it might be engaged in, would have been totally deſtroyed, or ceaſed to exiſt as a diſtinct kingdom. The late diſmemberment of Poland, however, or its partition between the three powers Ruſſia, Hungary, and Pruſſia, was a ſtep very inconſiſtent with the above political ſyſtem; and it is ſurpriſing with what tameneſs it was acquieſced in by the other powers. Subſequent circumſtances, particularly the paſſiveneſs with which the ambitious deſigns of Ruſſia againſt the Porte have been ſo long beheld, ſeem to indicate a total dereliction of that ſcheme of equilibrium, formerly ſo wiſely, though perhaps ſometimes too anxiouſly, attended to.

The revolt of the Britiſh colonies in America, it was hoped by the enemies of Britain, would have given a fatal ſhock to her ſtrength and wonted ſuperiority. The conſequences, however, have been very different. Thoſe colonies, it is true, have been disjoined from the mother-country, and have attained an independent rank among the nations. But Britain has had no cauſe to repine at the ſeparation. Diveſted only of a ſplendid encumbrance, an expenſive and invidious appanage, ſhe has been left to enjoy the undivided benefits of her native vigour, and to diſplay new energies, which promiſe her mild empire a long and proſperous duration. On the other hand, it has been ſaid, the flame which was to have blazed only to *her* prejudice, has brought confuſion on her chief foe; and the ambition and tyranny of that branch of the houſe of Bourbon which has been long the peſt of Europe, now lie humbled in the duſt. The French, indeed, have thus become a nation

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of freemen as well as ourselves, and as well as the Americans; who, by the way, were never otherwise, nor ever knew what oppression was except in inflicting it upon their African brethren. But neither is the French revolution an event which Britons, as lovers of liberty and friends to the rights of mankind, should regret; or which, even in a political view, if duly considered, ought to excite either their jealousy or apprehension. The papal power, too, is declining; and the period seems to be approaching when the Roman pontiff will be reduced to his original title of *bishop of Rome*. Such was the language held for some years during the progress of the French revolution. But the extraordinary events which have since occurred, have totally changed the views and sentiments of mankind. The fair prospect of liberty which the friends of humanity hoped had begun to dawn on France, has quite vanished; and unfortunately the most powerful despot, as well as the most capricious tyrant, has seated himself on the throne of her ancient kings. The prediction with regard to the pope was more than verified by this usurper, at whose nod the head of the catholic church holds his authority; and at this moment (December 1806) the continent of Europe seems to be threatened with universal subjugation to the same restless and ambitious power.

Sect. II. *Ecclesiastical History.*

50 Revolutions in religion seldom happen.

The history of religion, among all the different nations that have existed in the world, is a subject no less important and interesting than that of civil history. It is, however, less fertile of great events, affords an account of fewer revolutions, and is much more uniform, than civil history. The reason of this is plain. Religion is conversant about things which cannot be seen; and which of consequence cannot suddenly and strongly affect the senses of mankind, as natural things are apt to do. The expectation of worldly riches can easily induce one nation to attack another; but it is not easy to find any thing which will induce a nation to change its religion. The invisible nature of spiritual things, the prejudice of habit and of early education, all stand in the way of changes of this kind. Hence the revolutions in religion have been but few, and the duration of almost any religion of longer standing than the most celebrated empires; the changes which have happened, in general, have acquired a long time to bring them about, and history scarce affords an instance of the religion of any nation being essentially and suddenly changed for another.

With regard to the origin of religion, we must have recourse to the Scriptures; and are as necessarily constrained to adopt the account there given, as we are to adopt that of the creation given in the same book; namely, because no other hath made its appearance which seems in any degree rational, or consistent with itself.—In what manner the true religion given to Adam was falsified or corrupted by his descendants before the flood, doth not clearly appear from Scripture. Idolatry is not mentioned: nevertheless we are assured that the inhabitants of the world were then exceedingly wicked; and as their wickedness did not consist in worshipping false gods, it may be concluded that they worshipped none at all; i. e. that the crime of the antediluvians was deism or atheism.

51 Origin of idolatry.

After the flood, idolatry quickly made its appearance; but what gave rise to it is not certainly known. This superstition indeed seems to be natural to man, especially when placed in such a situation that he hath little opportunity of instruction, or of improving his rational faculties. This seems also probable from a caution given to the Jews, lest, when they looked up to the sun, moon, and stars, and the rest of the host of heaven, they should be *driven to worship them*. The origin of idolatry among the Syrians and Arabians, and also in Greece, is therefore accounted for with great probability in the following manner by the author of The Ruins of Balbeck. "In those uncomfortable deserts, where the day presents nothing to the view but the uniform, tedious, and melancholy prospect of barren sands, the night discloses a most delightful and magnificent spectacle, and appears arrayed with charms of the most attractive kind. For the most part unclouded and serene, it exhibits to the wondering eye the host of heaven in all their variety and glory. In the view of this stupendous scene, the transition from admiration to idolatry was too easy to uninstructed minds; and a people whose climate offered no beauties to contemplate but those of the firmament, would naturally look thither for the objects of their worship. The form of idolatry in Greece was different from that of the Syrians; which perhaps may be attributed to that smiling and variegated scene of mountains, valleys, rivers, woods, groves, and fountains, which the transported imagination, in the midst of its pleasing astonishment, supposed to be the seats of invisible deities."

A difficulty, however, arises on this supposition; for if idolatry is naturally produced in the mind of uninstructed and savage man from a view of the creation, why hath not idolatry of some kind or other taken place among all the different nations of the world? This certainly hath not been the case; of which the most striking examples are the Persians of old, and the Moguls in more modern times. Both these nations were strict deists; so that we must allow some other causes to concur in producing idolatry besides these already mentioned; and of these causes an imperfect and obscure notion of the true religion seems to be the most probable.

52 General account of the Heathen superstitions.

Though idolatry, therefore, was formerly very prevalent, it neither extended over the whole earth, nor were the superstitions of the idolaters all of one kind. Every nation had its respective gods, over which one more excellent than the rest was said to preside; yet in such a manner, that this supreme deity himself was controuled by the rigid empire of the fates, or by what philosophers called *eternal necessity*. The gods of the east were different from those of the Gauls, the Germans, and the other northern nations. The Grecian divinities differed widely from those of the Egyptians, who deified plants, animals, and a great variety of the productions both of nature and art. Each people also had their own particular manner of worshipping and appeasing their respective deities, entirely different from the sacred rites of other countries. All this variety of religions, however, produced neither wars nor dissensions among the different nations; each nation suffered its neighbours to follow their own method of worship, without discovering any displeasure on that account.

There

Eccleſiaſtical Hiſtory.

There is nothing ſurpriſing in this mutual toleration, when we conſider, that they all looked upon the world as one great empire, divided into various provinces, over each of which a certain order of divinities preſided; for which reaſon they imagined that none could behold with contempt the gods of other nations, or force ſtrangers to pay homage to theirs.—The Romans exerciſed this toleration in the moſt ample manner; for though they would not allow any change to be made in the religions that were publicly profeſſed in the empire, nor any new form of worſhip to be openly introduced, yet they granted to their citizens a full liberty of obſerving in private the ſacred rites of other nations, and of honouring foreign deities as they thought proper.

The heathen deities were honoured with rites and ſacrifices of various kinds, according to their reſpective natures and offices. Their rites were abſurd and ridiculous; while the prieſts, appointed to preſide over this ſtrange worſhip, abuſed their authority, by deceiving and impoſing upon the people in the groſſeſt manner.

53 State of religion at the appearance of Chriſt.

From the time of the flood to the coming of Chriſt, idolatry prevailed among almoſt all the nations of the world, the Jews alone excepted; and even they were on all occaſions ready to run into it, as is evident from their hiſtory in the Old Teſtament. At the time of Chriſt's appearance, the religion of the Romans, as well as their empire, extended over a great part of the world. Some people there were among the heathens who perceived the abſurdities of that ſyſtem; but being deſtitute of means, as well as of abilities, to effect a reformation, matters went on in their old way. Though there were at that time various ſects of philoſophers, yet all of them proceeded upon falſe principles, and conſequently could be of no ſervice to the advancement or reformation of religion. Nay, ſome, among whom were the Epicureans and Academics, declared openly againſt every kind of religion whatever.

Two religions at this time flouriſhed in Paleſtine, viz. the Jewiſh and Samaritan; between whoſe reſpective followers reigned the moſt violent hatred or contempt. The difference between them ſeems to have been chiefly about the place of worſhip; which the Jews would have to be in Jeruſalem, and the Samaritans on Mount Gerizzim. But though the Jews were certainly right as to this point, they had greatly corrupted their religion in other reſpects. They expected a Saviour indeed, but they miſtook his character; imagining that he was to be a powerful and warlike prince, who ſhould ſet them free from the Roman yoke, which they bore with the utmoſt impatience. They alſo imagined that the whole of religion conſiſted in obſerving the rites of Moſes, and ſome others which they had added to them, without the leaſt regard to what is commonly called *morality* or *virtue*; as is evident from the many charges our Saviour brings againſt the Phariſees, who had the greateſt reputation for ſanctity among the whole nation. To theſe corrupt and vicious principles, they added ſeveral abſurd and ſuperſtitious notions concerning the divine nature, inviſible powers, magic, &c. which they had partly imbibed during the Babylonian captivity, and parly derived from their neighbours in Arabia, Syria, and Egypt. The principal ſects among them were the ESSENES or Eſſenians, PHARISEES, and SADDUCEES. The Samaritans, according to the moſt general opinion, had corrupted their religion ſtill more than the Jews.

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When the true religion was preached by the Saviour of mankind, it is not to be wondered at if he became on that account obnoxious to a people ſo deeply ſunk in corruption and ignorance as the Jews then were. It is not here requiſite to enter into the particulars of the doctrine advanced by him, or of the oppoſition he met with from the Jews; as a full account of theſe things, and likewiſe of the preaching of the goſpel by the apoſtles, may be found in the New Teſtament.—The rapid progreſs of the Chriſtian religion, under theſe faithful and inſpired miniſters, ſoon alarmed the Jews, and raiſed various perſecutions againſt its followers. The Jews, indeed, ſeem at firſt to have been everywhere the chief promoters of perſecution; for we find that they officiouſly went from place to place, wherever they heard of the increaſe of the goſpel, and by their calumnies and falſe ſuggeſtions endeavoured to excite the people againſt the apoſtles. The Heathens, however, though at firſt they ſhowed no very violent ſpirit of perſecution againſt the Chriſtians, ſoon came to hate them as much as the Jews themſelves. Tacitus acquaints us with the cauſes of this hatred, when ſpeaking of the firſt general perſecution under Nero. That inhuman emperor having, as was ſuppoſed, ſet fire to the city of Rome, to avoid the imputation of this wickedneſs, transferred it on the Chriſtians. Our author informs us that they were already abhorred on account of their many and enormous crimes. "The author of this name (*Chriſtians*)," ſays he, "was CHRIST, who, in the reign of Tiberius, was executed under Pontius Pilate, procurator of Judæa. The peſtilent ſuperſtition was for a while ſuppreſſed: but it revived again, and ſpread, not only over Judæa, where this evil was firſt broached, but reached Rome, whither from every quarter of the earth is conſtantly flowing whatever is hideous and abominable amongſt men, and is there readily embraced and practiſed. Firſt, therefore, were apprehended ſuch as openly avowed themſelves to be of that ſect; then by them were diſcovered an immenſe multitude; and all were convicted, not of the crime of burning Rome, but of hatred and enmity to mankind. Their death and tortures were aggravated by cruel deriſion and ſport; for they were either covered with the ſkins of wild beaſts and torn in pieces by devouring dogs, or faſtened to croſſes, or wrapped up in combuſtible garments, that, when the day-light failed, they might, like torches, ſerve to diſpel the darkneſs of the night. Hence, towards the miſerable ſufferers, however guilty and deſerving the moſt exemplary puniſhment, compaſſion aroſe; ſeeing they were doomed to periſh not with a view to the public good, but to gratify the cruelty of one man."

54 Tacitus's account of the firſt perſecution by Nero.

That this account of Tacitus is downright miſrepreſentation and calumny, muſt be evident to every one who reads it. It is impoſſible that any perſon can be convicted of hatred and enmity to mankind, without ſpecifying a number of facts by which this hatred ſhowed itſelf. The burning of Rome would indeed have been a very plain indication of enmity to mankind; but of this Tacitus himſelf clears them, and

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and mentions no other crime of which they were guilty. It is probable, therefore, that the only reason of this charge against the Christians, was their absolute refusal to have any share in the Roman worship, or to countenance the absurd superstitions of Paganism in any degree.

55
Second persecution.

The persecution under Nero was succeeded by another under Domitian; during which the apostle John was banished to Patmos, where he saw the visions, and wrote the book called his *Revelation*, which completes the canon of Scripture. This persecution commenced in the 95th year of the Christian era; and John is supposed to have written his Revelation the year after, or in the following one.

During the first century, the Christian religion spread over a great number of different countries; but as we have now no authentic records concerning the travels of the apostles, or the success which attended them in their ministry, it is impossible to determine how far the gospel was carried during this period. We are, however, assured, that even during this early period many corruptions were creeping in, the progress of which was with difficulty prevented even by the apostles themselves. Some corrupted their profession by a mixture of Judaism, others by mixing it with the oriental philosophy; while others were already attempting to deprive their brethren of liberty, setting themselves up as eminent pastors, in opposition even to the apostles, as we learn from the epistles of St Paul, and the third epistle of St John. Hence arose the sects of the Gnostics, Cerinthians, Nicolaitans, Nazarenes, Ebionites, &c. with which the church was troubled during this century.

Concerning the ceremonies and method of worship used by the Christians of the first century, it is impossible to say any thing with certainty. Neither is the church order, government, and discipline, during this period, ascertained with any degree of exactness. Each of those parties, therefore, which exist at this day, contends with the greatest earnestness for that particular mode of worship which they themselves have adopted; and some of the most bigotted would willingly monopolize the word *church* in such a manner as to exclude from all hope of salvation every one who is not attached to their particular party. It doth not however appear that, excepting baptism, the Lord's supper, and anointing the sick with oil, any external ceremonies or symbols were properly of divine appointment. According to Dr Mosheim, "there are several circumstances which incline us to think, that the friends and apostles of our blessed Lord either tolerated through necessity, or appointed for wise reasons, many other external rites in various places. At the same time, we are not to imagine, that they ever conferred upon any person a perpetual, indelible, pontifical authority, or that they enjoined the same rites in all churches. We learn, on the contrary, from authentic records, that the Christian worship was from the beginning celebrated in a different manner in different places; and that, no doubt, by the orders, or at least with the approbation, of the apostles and their disciples. In those early times, it was both wise and necessary to show, in the establishment of outward forms of worship, some indulgence to the ancient opinions, manners, and laws, of the respective nations to whom the gospel was preached."

56
History of the second century.

The second century commences with the third year of the emperor Trajan. The Christians were still persecuted; but as the Roman emperors were for the most part of this century princes of a mild and moderate turn, they persecuted less violently than formerly. Marcus Aurelius, notwithstanding the clemency and philosophy for which he is so much celebrated, treated the Christians worse than Trajan, Adrian, or even Severus himself did, who was noted for his cruelty. This respite from vigorous persecution proved a very favourable circumstance for the spreading of the Christian religion; yet it is by no means easy to point out the particular countries through which it was diffused. We are, however, assured, that in the second century, Christ was worshipped as God almost through the whole east; as also among the Germans, Spaniards, Celtes, and many other nations: but which of them received the gospel in the first century, and which in the second, is a question unanswerable at this distance of time. The writers of this century attribute the rapid progress of Christianity chiefly to the extraordinary gifts that were imparted to the first Christians, and the miracles which were wrought at their command; without supposing that any part of the success ought to be ascribed to the intervention of human means, or secondary causes. Many of the moderns, however, are so far from being of this opinion, that they are willing either to deny the authenticity of all miracles said to have been wrought since the days of the apostles, or to ascribe them to the power of the devil. To enter into the particulars of this controversy is foreign to our present purpose; for which reason we must refer to the writers of polemic divinity, who have largely treated of this and other points of a similar nature.

57
Ceremonies multiplied.

The corruptions which had been introduced in the first century, and which were almost coeval with Christianity itself, continued to gain ground in the second. Ceremonies, in themselves futile and useless, but which must be considered as highly pernicious when joined to a religion incapable of any other ornament than the upright and virtuous conduct of its professors, were multiplied for no other purpose than to please the ignorant multitude. The immediate consequence of this was, that the attention of Christians was drawn aside from the important duties of morality; and they were led to imagine, that a careful observance of the ceremonies might make amends for the neglect of moral duties. This was the most pernicious opinion that could possibly be entertained; and was indeed the very foundation of that enormous system of ecclesiastical power which afterwards took place, and held the whole world in slavery and barbarism for many ages.

58
Mysteries introduced.

Another mischief was the introduction of *mysteries*, as they were called, into the Christian religion; that is, insinuating that some parts of the worship in common use had a hidden efficacy and power far superior to the plain and obvious meaning assigned to them by the vulgar: and by paying peculiar respect to these mysteries, the pretended teachers of the religion of Jesus accommodated their doctrines to the taste of their heathen neighbours, whose religion consisted in a heap of mysteries, of which nobody knew the meaning.

By

59 The teachers assume a power over the people.

By these, and other means of a similar kind, the Christian pastors greatly abridged the liberty of their flock. Being masters of the ceremonies and mysteries of the Christian religion, they had it in their power to make their followers worship and believe whatever they thought proper; and this they did not fail to make use of for their own advantage. They persuaded the people, that the ministers of the Christian church succeeded to the character, rights, and privileges, of the Jewish priesthood; and accordingly the bishops considered themselves as invested with a rank and character similar to those of the high-priest among the Jews, while the presbyters represented the priests, and the deacons the Levites. This notion, which was first introduced in the reign of Adrian, proved a source of very considerable honour and profit to the clergy.

60 Form of church government.

The form of ecclesiastical government was in this century rendered permanent and uniform. One inspector or bishop presided over each Christian assembly, to which office he was elected by the voices of the whole people. To assist him in his office, he formed a council of presbyters, which was not confined to any stated number. To the bishops and presbyters the ministers or *deacons* were subject; and the latter were divided into a variety of classes, as the different exigencies of the church required. During a great part of this century, the churches were independent of each other; nor were they joined together by association, confederacy, or any other bonds but those of charity. Each assembly was a little state governed by its own laws, which were either enacted, or at least approved of, by the society. But in process of time all the Christian churches of a province were formed into one large ecclesiastical body, which, like confederate states, assembled at certain times, in order to deliberate about the common interests of the whole. This institution had its origin among the Greeks; but in a short time it became universal, and similar assemblies were formed in all places where the gospel had been planted. These assemblies, which consisted of the deputies or commissioners from several churches, were called *synods* by the Greeks, and *councils* by the Latins; and the laws enacted in these general meetings were called *canons*, i. e. *rules*.

61 Changes produced by the institution of councils.

These councils, of which we find not the smallest trace before the middle of this century, changed the whole face of the church, and gave it a new form; for by them the ancient privileges of the people were considerably diminished, and the power and authority of the bishops greatly augmented. The humility, indeed, and prudence, of these pious prelates hindered them from assuming all at once the power with which they were afterwards invested. At their first appearance in these general councils, they acknowledged that they were no more than the delegates of their respective churches, and that they acted in the name and by the appointment of their people. But they soon changed this humble tone; imperceptibly extended the limits of their authority; turned their influence into dominion, their counsels into laws; and at length openly asserted, that Christ had empowered them to prescribe to his people *authoritative rules* of *faith* and *manners*. Another effect of these councils was the gradual abolition of that perfect equality which reigned among all bishops in the primitive times: for the order and decency of these assemblies required, that some one of the provincial bishops met in council should be invested with a superior degree of power and authority; and hence the rights of metropolitans derive their origin. In the mean time, the bounds of the church were enlarged; the custom of holding councils was followed wherever the sound of the gospel had reached; and the universal church had now the appearance of one vast republic formed by a combination of a great number of little states. This occasioned the creation of a new order of ecclesiastics, who were appointed in different parts of the world as heads of the church, and whose office it was to preserve the consistence and union of that immense body, whose members were so widely dispersed throughout the nations. Such was the nature and office of the *Patriarchs*; among whom, at length, ambition, being arrived at its most insolent period, formed a new dignity, investing the bishop of Rome with the title and authority of the *Prince of the Patriarchs*.

62 Account of the Ascetics.

During the second century, all the sects continued which had sprung up in the first, with the addition of several others; the most remarkable of which were the *Ascetics*. These owed their rise to an error propagated by some doctors of the church, who asserted that Christ had established *a double rule of sanctity and virtue* for two different orders of Christians. Of these rules, one was ordinary, the other extraordinary; the one of a lower dignity, the other more sublime: the first for persons in the active scenes of life; the other for those who, in a sacred retreat, aspired after the glory of a celestial state. In consequence of this system, they divided into two parts all those moral doctrines and instructions which they had received either by writing or tradition. One of these divisions they called *precepts*, and the other *counsels*. They gave the name of *precepts* to those laws that were universally obligatory upon all orders of men; and that of *counsels* to those which related to Christians of a more sublime rank, who proposed to themselves great and glorious ends, and breathed after an intimate communion with the Supreme Being.—Thus were produced all at once a new set of men, who made pretensions to uncommon sanctity and virtue, and declared their resolution of obeying all the *precepts* and *counsels* of Christ, in order to their enjoyment and communion with God here, and also that, after the dissolution of their mortal bodies, they might ascend to him with the greater facility, and find nothing to retard their approach to the centre of happiness and perfection. They looked upon themselves as prohibited from the use of things which it was lawful for other Christians to enjoy; such as wine, flesh, matrimony, and commerce. They thought it their indispensable duty to extenuate their body by watchings, abstinence, labour, and hunger. They looked for felicity in solitary retreats, and desert places; where, by severe and assiduous efforts of sublime meditation, they raised the soul above all external objects, and all sensual pleasures. They were distinguished from other Christians, not only by the titles of *Ascetics*, Σπȣδαιοι, Εκλεκτοι, and philosophers, but also by their garb. In this century, indeed, those who embraced such an austere kind of life, submitted themselves to all these mortifications in private, without breaking asunder their social bands, or withdrawing themselves

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themselves from mankind; but in process of time they retired into deserts, and, after the example of the Essenes and Therapeutæ, they formed themselves into certain companies.

This austere sect arose from an opinion which has been more or less prevalent in all ages and in all countries, namely, that religion consists more in prayers, meditations, and a kind of secret intercourse with God, than in fulfilling the social duties of life in acts of benevolence and humanity to mankind. Nothing can be more evident than that the Scripture reckons the fulfilling of these infinitely superior to the observance of all the ceremonies that can be imagined: yet it somehow or other happens, that almost every body is more inclined to observe the ceremonial part of devotion than the moral; and hence, according to the different humours or constitutions of different persons, there have been numberless forms of Christianity, and the most virulent contentions among those who professed themselves followers of the Prince of Peace. It is obvious, that if the moral conduct of Christians was to be made the standard of faith, instead of speculative opinions, all these divisions must cease in a moment; but while Christianity, or any part of it, is made to consist in speculation, or the observance of ceremonies, it is impossible there can be any end of sects or heresies. No opinion whatever is so absurd, but some people have pretended to argue in its defence; and no ceremony so insignificant, but it hath been explained and sanctified by hot-headed enthusiasts; and hence ceremonies, sects, and absurdities, have been multiplied without number, to the prejudice of society and of the Christian religion. This short relation of the rise of the Ascetic sect will also serve to account for the rise of any other; so that we apprehend it is needless to enter into particulars concerning the rest, as they all took their origin from the same general principle variously modified, according to the different dispositions of mankind.

The Ascetic sect began first in Egypt, from whence it passed into Syria and the neighbouring countries. At length it reached the European nations: and hence that train of austere and superstitious vows and rites which totally obscured, or rather annihilated, Christianity; the celibacy of the clergy, and many other absurdities of the like kind. The errors of the Ascetics, however, did not stop here: In compliance with the doctrines of some Pagan philosophers, they affirmed, that it was not only lawful, but even praise-worthy to deceive, and to use the expedient of a lie, in order to advance the cause of piety and truth; and hence the *pious frauds* for which the church of Rome hath been so notorious, and with which she hath been so often and justly reproached.

As Christians thus deviated more and more from the true practice of their religion, they became more zealous in the external profession of it. Anniversary festivals were celebrated in commemoration of the death and resurrection of Christ, and of the effusion of the Holy Ghost on the apostles. Concerning the days on which these festivals were to be kept, there arose violent contests. The Asiatic churches in general differed in this point from those of Europe; and towards the conclusion of the second century, Victor bishop of Rome took it in his head to force the eastern churches to follow the rules laid down by the western ones.—

63 Contests concerning festivals.

This they absolutely refused to comply with: upon which Victor cut them off from communion with the church of Rome; though, by means of the intercession of some prudent people, the difference was made up for the present.

64 Third century.

During most of the third century, the Christians were allowed to enjoy their religion, such as it was, without molestation. The emperors Maximinus and Decius, indeed, made them feel all the rigours of a severe persecution; but their reigns were short, and from the death of Decius to the time of Dioclesian the church enjoyed tranquillity. Thus vast multitudes were converted; but at the same time, the doctrine grew daily more corrupt, and the lives of professed Christians more wicked and scandalous. New ceremonies were invented in great numbers, and an unaccountable passion now prevailed for the oriental superstitions concerning demons, whence proceeded the whole train of exorcisms, spells, and fears for the apparition of evil spirits, which to this day are nowhere eradicated. Hence also the custom of avoiding all connections with those who were not baptized, or who lay under the penalty of excommunication, as persons supposed to be under the dominion of some evil spirit. And hence the rigour and severity of that discipline and penance imposed upon those who had incurred, by their immoralities, the censure of the church. Several alterations were now made in the manner of celebrating the Lord's supper. The prayers used on this occasion were lengthened, and the solemnity and pomp with which it was attended were considerably increased. Gold and silver vessels were used in the celebration; it was thought essential to salvation, and for that reason administered even to infants. Baptism was celebrated twice a-year to such as, after a long course of trial and preparations, offered themselves candidates. The remission of sins was thought to be its immediate consequence; while the bishop, by prayer and imposition of hands, was supposed to confer those sanctifying gifts of the Holy Ghost that were necessary to a life of righteousness and virtue. An evil demon was supposed naturally to reside in every person, who was the author and source of all the corrupt dispositions and unrighteous actions of that person. The driving out of this demon was therefore an essential requisite for baptism; and in consequence of this opinion, the baptized person returned home clothed in white garments, and adorned with crowns, as sacred emblems, the former of their inward purity and innocence, and the latter of their victory over sin and the world.—Fasting began now to be held in more esteem than formerly. A high degree of sanctity was attributed to this practice; it was even looked upon as indispensably necessary, from a notion that the demons directed their force chiefly against those who pampered themselves with delicious fare, and were less troublesome to the lean and hungry who lived under the severities of a rigorous abstinence.—The sign of the cross also was supposed to administer a victorious power over all sorts of trials and calamities; and was more especially considered as the surest defence against the snares and stratagems of malignant spirits; for which reason, no Christian undertook any thing of moment, without arming himself, as he imagined, with the power of this triumphant sign. The heresies which troubled the

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the church during this century, were the GNOSTICS, (whose doctrines were new-modelled and improved by Manes, from whom they were afterwards chiefly called *Manicheans*), the HIERACITES, NOETIANS, SABELLIANS, and NOVATIANS; for a particular account of which, see those articles.

65 Fourth century.

The fourth century is remarkable for the establishment of Christianity by law in the Roman empire; which, however, did not take place till the year 324. In the beginning of the century, the empire was governed by four chiefs, viz. Dioclesian, Maximian, Constantius Chlorus, and Galerius, under whom the church enjoyed a perfect toleration. Dioclesian, though much addicted to superstition, had no ill-will against the Christians; and Constantius Chlorus, having abandoned polytheism, treated them with condescension and benevolence. This alarmed the Pagan priests, whose interests were so closely connected with the continuance of the ancient superstitions; and who apprehended, not without reason, that the Christian religion would at length prevail throughout the empire. To prevent the downfal of the Pagan superstition, therefore, they applied to Dioclesian and Galerius Cæsar, by whom a most bloody persecution was commenced in the year 303, and continued till 311. An asylum, however, was opened for the Christians in the year 304. Galerius having dethroned Dioclesian and Maximian, declared himself emperor in the east; leaving all the western provinces, to which great number of Christians resorted to avoid the cruelty of the former, to Constantius Chlorus. At length Galerius, being overtaken with an incurable and dreadful disease, published an edict ordering the persecution to cease, and restoring freedom to the Christians, whom he had most inhumanly oppressed for eight years. Galerius died the same year; and in a short time after, when Constantine the Great ascended the throne, the Christians were freed from any farther uneasiness, by his abrogating all the penal laws against them; and afterwards issuing edicts, by which no other religion than the Christian was tolerated throughout the empire.

66 Christianity established by Constantine.

67 Increase of its corruptions.

This event, however, so favourable to the outward peace of the church, was far from promoting its internal harmony, or the reformation of its leaders. The clergy, who had all this time been augmenting their power at the expence of the liberty of the people, now set no bounds to their ambition. The bishop of Rome was the first in rank, and distinguished by a sort of pre-eminency above the rest of the prelates. He surpassed all his brethren in the magnificence and splendor of the church over which he presided, in the riches of his revenues and possessions, in the number and variety of his ministers, in his credit with the people, and in his sumptuous and splendid manner of living. Hence it happened, that when a new pontiff was to be chosen by the presbyters and people, the city of Rome was generally agitated with dissensions, tumults, and cabals, which often produced fatal consequences. The intrigues and disturbances which prevailed in that city in the year 366, when, upon the death of Liberius, another pontiff was to be chosen in his place, are a sufficient proof of what we have advanced. Upon this occasion, one faction elected Damasus to that high dignity; while the opposite party chose Ursicinus, a deacon of the vacant church, to succeed Liberius. This double election gave rise to a dangerous schism, and to a sort of civil war within the city of Rome; which was carried on with the utmost barbarity and fury, and produced the most cruel massacres and desolations. The inhuman contest ended in the victory of Damasus; but whether his cause was more just than that of Ursicinus, is not so easily determined.

Notwithstanding the pomp and splendour which surrounded the Roman see, it is certain that the bishops of Rome had not yet acquired that pre-eminence of power and jurisdiction which they afterwards enjoyed. In the ecclesiastical commonwealth, indeed, they were the most eminent order of citizens; but still they were citizens as well as their brethren, and subject, like them to the laws and edicts of the emperors. All religious causes of extraordinary importance were examined and determined either by judges appointed by the emperors, or in councils assembled for that purpose; while those of inferior moment were decided in each district by its respective bishop. The ecclesiastical laws were enacted either by the emperor or councils. None of the bishops acknowledged that they derived their authority from the permission and appointment of the bishop of Rome, or that they were created bishops by the favour of the *apostolic see*. On the contrary, they all maintained that they were the ambassadors and ministers of Jesus Christ, and that their authority was derived from above. It must, however, be observed, that even in this century several of those steps were laid by which the bishops of Rome mounted afterwards to the summit of ecclesiastical power and despotism. This happened partly by the imprudence of the emperors, partly by the dexterity of the Roman prelates themselves, and partly by the inconsiderate zeal and precipitate judgment of certain bishops. The imprudence of the emperor, and precipitation of the bishops, were remarkably discovered in the following event, which favoured extremely the ambition of the Roman pontiff. About the year 372, Valentinian enacted a law, empowering the bishop of Rome to examine and judge other bishops, that religious disputes might not be decided by any profane or secular judges. The bishops assembled in council at Rome in 378, not considering the fatal consequences that must arise from this imprudent law both to themselves and to the church, declared their approbation in the strongest terms, and recommended the execution of it in their address to the emperor Gratian. Some think, indeed, that this law empowered the Roman bishop to judge only the bishops within the limits of his jurisdiction; others, that his power was given only for a certain time, and for a particular purpose. This last notion seems the most probable; but still this privilege must have been an excellent instrument in the hands of sacerdotal ambition.

68 Bishops of Rome and Constantinople rival each other.

By the removal of the seat of empire to Constantinople, the emperor raised up, in the bishop of this new metropolis, a formidable opponent to the bishop of Rome, and a bulwark which threatened a vigorous opposition to his growing authority. For as the emperor, in order to render Constantinople a second Rome, enriched it with all the rights and privileges, honours and ornaments, of the ancient capital of the world;

world; ſo its biſhop, meaſuring his own dignity and rank by the magnificence of the new city, and its eminence as the reſidence of the emperor, aſſumed an equal degree of dignity with the biſhop of Rome, and claimed a ſuperiority over the reſt of the epiſcopal order. Nor did the emperors diſapprove of theſe high pretenſions, ſince they conſidered their own dignity as connected in a certain meaſure with that of the biſhop of their imperial city. Accordingly, in a council held at Conſtantinople in the year 381, by the authority of Theodoſius the Great, the biſhop of that city was, during the abſence of the biſhop of Alexandria, and againſt the conſent of the Roman prelate, placed by the third canon of that council in the firſt rank after the biſhop of Rome, and conſequently above thoſe of Alexandria and Antioch. Nectarius was the firſt biſhop who enjoyed theſe new honours accumulated upon the ſee of Conſtantinople. His ſucceſſor, the celebrated John Chryſoſtom, extended ſtill farther the privileges of that ſee, and ſubmitted to its juriſdiction all Thrace, Aſia, and Pontus; nor were the ſucceeding biſhops of that imperial city deſtitute of a fervent zeal to augment their privileges and extend their dominion. By this unexpected promotion, the moſt diſagreeable effects were produced. The biſhops of Alexandria were not only filled with the moſt inveterate hatred againſt thoſe of Conſtantinople, but contention was excited between the biſhops of Rome and Conſtantinople; which, after being carried on for many ages, concluded at laſt in the ſeparation of the Greek and Latin churches.

69 Form of church government eſtabliſhed by Conſtantine.

Conſtantine the Great, in order to prevent civil commotions, and to fix his authority on a ſtable and ſolid foundation, made ſeveral changes not only in the laws of the empire, but alſo in the form of the Roman government. And as there were many important reaſons which induced him to ſuit the adminiſtration of the church to theſe changes in the civil conſtitution, this neceſſarily introduced among the biſhops new degrees of eminence and rank. The four biſhops, of Rome, Conſtantinople, Antioch, and Alexandria, were diſtinguiſhed by a certain degree of pre-eminence over the reſt. Theſe four prelates anſwered to the four prætorian prefects created by Conſtantine; and it is poſſible, that even in this century they were diſtinguiſhed by the Jewiſh title of *patriarchs*. After theſe followed the *exarchs*, who had the inſpection of ſeveral provinces, and anſwered to the appointment of certain civil officers who bore the ſame title. In a lower claſs were the *metropolitans*, who had only the government of one province; under whom were the *archbiſhops*, whoſe inſpection was confined to certain diſtricts. In this gradation the *biſhops* brought up the rear; but the ſphere of their authority was not in all places equally extenſive; being in ſome conſiderably ample, and in others confined within narrow limits. To theſe various eccleſiaſtical orders we might add that of the *chorepiſcopi*, or ſuperintendents of the country churches; but this laſt order was in moſt places ſuppreſſed by the biſhops, with a deſign to extend their own authority, and enlarge the ſphere of their power and juriſdiction. The adminiſtration of the church itſelf was divided by Conſtantine into an *external* and *internal* inſpection. The latter, which was committed to biſhops and councils, related to religious controverſies, the forms of divine worſhip, the offices of prieſts, the vices of the eccleſiaſtical orders, &c. The external adminiſtration of the church the emperor aſſumed to himſelf. This comprehended all thoſe things which related to the outward ſtate and diſcipline of the church; it likewiſe extended to all conteſts that ſhould ariſe between the miniſters of the church, ſuperior as well as inferior, concerning their poſſeſſions, their reputation, their rights and privileges, their offences againſt the laws, &c. but no controverſies that related to matters purely ſpiritual were cognizable by this external inſpection. In conſequence of this artful diviſion of the eccleſiaſtical government, Conſtantine and his ſucceſſors called councils, preſided in them, appointed the judges of religious controverſies, terminated the differences which aroſe between the biſhops and the people, fixed the limits of the eccleſiaſtical provinces, took cognizance of the civil cauſes that ſubſiſted between the miniſters of the church, and puniſhed the crimes committed againſt the laws by the ordinary judges appointed for that purpoſe; giving over all cauſes purely eccleſiaſtical to the biſhops and councils. But this famous diviſion of the adminiſtration of the church was never explained with ſufficient accuracy; ſo that both in the fourth and fifth centuries, there are frequent inſtances of the emperors determining matters purely eccleſiaſtical, and likewiſe of biſhops and councils determining matters which related merely to the external form and government of the church.

70 Scandalous lives of the clergy.

After the time of Conſtantine many additions were made by the emperors and others to the wealth and honours of the clergy; and theſe additions were followed by a proportional increaſe of their vices and luxury, particularly among thoſe who lived in great and opulent cities. The biſhops, on the one hand, contended with each other in the moſt ſcandalous manner concerning the extent of their reſpective juriſdictions; while, on the other, they trampled on the rights of the people, violated the privileges of the inferior miniſters, and imitated in their conduct and in their manner of living the arrogance, voluptuouſneſs, and luxury of magiſtrates and princes. This pernicious example was ſoon followed by the ſeveral eccleſiaſtical orders. The preſbyters, in many places, aſſumed an equality with the biſhops in point of rank and authority. Many complaints are alſo made by the authors of this century about the vanity and effeminacy of the deacons. Thoſe more particularly of the preſbyters and deacons who filled the firſt ſtations of theſe orders, carried their pretenſions to an extravagant length, and were offended at the notion of being placed on an equality with their colleagues. For this reaſon they not only aſſumed the titles of *arch-preſbyters* and *arch-deacons*, but alſo claimed a degree of authority and power much ſuperior to that which was veſted in the other members of their reſpective orders.

71 Conteſts between the biſhops of Rome and Conſtantinople.

In the fifth century, the biſhops of Conſtantinople having already reduced under their juriſdiction all the Aſiatic provinces, began to graſp at ſtill further acceſſions of power. By the 28th canon of the council held at Chalcedon in 451, it was reſolved, that the ſame rights and honours which had been conferred on the biſhop of Rome were due to the biſhop of Conſtantinople, on account of the equal dignity and luſtre of the two cities in which theſe prelates exerciſed their authority.

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authority. The same council confirmed also, by a solemn act, the bishop of Constantinople in the spiritual government of those provinces over which he had usurped the jurisdiction. Leo the Great, bishop of Rome, opposed with vehemence the passing of these laws; and his opposition was seconded by that of several other prelates. But their efforts were vain, as the emperors threw in their weight into the balance, and thus supported the decisions of the Grecian bishops. In consequence, then, of the decisions of this famous council, the bishop of Constantinople began to contend obstinately for the supremacy with the Roman pontiff, and to crush the bishops of Antioch and Alexandria. About the same time, Juvenal, bishop of Jerusalem, attempted to withdraw himself and his church from the jurisdiction of the bishop of Cœsarea, and aspired after a place among the first prelates of the Christian world. The high degree of veneration and esteem in which the church of Jerusalem was held among all other Christian societies (on account of its rank among the apostolical churches, and its title to the appellation of *mother-church*, as having succeeded the first Christian assembly formed by the apostles), was extremely favourable to the ambition of Juvenal, and rendered his project much more practicable than it would otherwise have been. Encouraged by this, and likewise by the protection of Theodosius the younger, this aspiring prelate not only assumed the dignity of patriarch of all Palestine, a rank which rendered him independent of all spiritual authority; but also invaded the rights of the bishop of Antioch, and usurped his jurisdiction over the provinces of Phœnicia and Arabia. Hence arose a warm contest between Juvenal and Maximus bishop of Antioch; which the council of Chalcedon decided, by restoring to the latter the provinces of Phœnicia and Arabia, and confirming the former in the spiritual possession of all Palestine and in the high rank which he had assumed in the church.

In 588, John, bishop of Constantinople, surnamed the *Faster*, either by his own authority or that of the emperor Mauritius, summoned a council at Constantinople to inquire into an accusation brought against Gregory, bishop of Antioch; and upon this occasion assumed the title of *œcumenical* or *universal bishop*. This title had been formerly enjoyed by the bishops of Constantinople without any offence: but now, Gregory the Great, at that time bishop of Rome, suspecting that John was aiming at the supremacy over all the churches, opposed his claim with the greatest vigour. For this purpose he applied by letters to the emperor, and others, whom he thought capable of assisting him in his opposition; but all his efforts were without effect; and the bishops of Constantinople were allowed to enjoy the disputed title, though not in the sense which had alarmed the Roman pontiff.

Gregory, however, adhered tenaciously to his purpose, raised new tumults and dissensions among the clergy, and aimed at nothing less than an unlimited supremacy over the Christian church. This ambitious design succeeded in the west; while, in the eastern provinces, his arrogant pretensions were scarcely respected by any but those who were at enmity with the bishop of Constantinople. How much the people were at this time deluded by the Roman pontiffs, appears from the expression of Ennodius, one of the flatterers of Symmachus (who was a prelate of but ambiguous fame), that the Roman pontiff was constituted judge in the place of God, which he filled as the vicegerent of the Most High. On the other hand, it is certain, from a variety of the most authentic records, that both the emperors and the nations in general were far from being disposed to bear with patience the yoke of servitude which the see of Rome was arrogantly imposing on the whole church.

72 Origin of the supremacy of the pope.

In the beginning of the seventh century, according to the most learned historians, Boniface III. engaged Phocas, emperor of Constantinople, to take from the bishop of that metropolis the title of *œcumenical* or *universal bishop*, and to confer it upon the Roman pontiff; and thus was first introduced the supremacy of the pope. The Roman pontiffs used all methods to maintain and enlarge this authority and pre-eminence, which they had acquired from one of the most odious tyrants that ever disgraced the annals of history.

In the eighth century, the power of the bishop of Rome, and of the clergy in general, increased prodigiously. The chief cause of this, besides the superstition of the people, was the method at that time used by the European princes to secure themselves on their thrones. All these princes being then employed either in usurpation or in self-defence, and the whole continent being in the most unsettled and barbarous condition, they endeavoured to attach warmly to their interests these whom they considered as their friends and clients. For this purpose they distributed among them extensive territories, cities, and fortresses, with the various rights and privileges belonging to them; reserving only to themselves the supreme dominion, and the military service of these powerful vassals. For this reason it was by the European princes reckoned a high instance of political prudence to distribute among the bishops and other Christian doctors the same sort of donations which had formerly been given to their generals and clients. By means of the clergy, they hoped to check the seditious and turbulent spirits of their vassals; and to maintain them in their obedience by the influence and authority of their bishops, whose commands were highly respected, and whose spiritual thunderbolts, rendered formidable by ignorance, struck terror into the boldest and most resolute hearts.

This prodigious accession to the opulence and authority of the clergy in the west, began at their head, viz. the Roman pontiff; from whence it spread gradually among the inferior sacerdotal orders. The barbarous nations who had received the gospel, looked upon the bishop of Rome as the successor of their chief druid or high priest: and as this tremendous druid had enjoyed, under the darkness of Paganism, a kind of boundless authority; so these barbarous nations thought proper to confer upon the chief bishop the same authority which had belonged to the chief druid. The pope received these august privileges with great pleasure; and lest, upon any change of affairs, attempts should be made to deprive him of them, he strengthened his title to these extraordinary honours by a variety of passages drawn from ancient history, and, what is still more astonishing, by arguments of a religious nature. This swelled the Roman druid to an enormous size; and gave to the see of Rome that high pre-eminence and despotic authority in civil and political

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political matters, that were unknown to former ages. Hence, among other unhappy circumstances, arose that monstrous and pernicious opinion, that such persons as were excluded from the communion of the church by the pontiff himself, or any of the bishops, thus forfeited, not only their civil rights and advantages as citizens, but even the common claims and privileges of humanity. This horrid opinion, which was a fatal source of wars, massacres, and rebellions without number, and which contributed more than any thing else to confirm and augment the papal authority, was borrowed by the clergy from the Pagan superstitions.—Though excommunication, from the time of Constantine the Great, was in every part of the Christian world attended with many disagreeable effects; yet its highest terrors were confined to Europe, where its aspect was truly formidable and hideous. It acquired also, in the eighth century, new accessions of terror; so that from that period the excommunication practised in Europe differed entirely from that which was in use in other parts of Christendom. Excommunicated persons were indeed considered in all places as objects of hatred both to God and man; but they were not, on that account, robbed of the privileges of citizens, nor of the rights of humanity; much less were those kings and princes, whom an insolent bishop had thought proper to exclude from the communion of the church, supposed to forfeit on that account their crowns or their territories. But from this century it was quite otherwise in Europe. Excommunication received that infernal power which dissolved all connexions; so that those whom the bishops, or their chief, excluded from church communion, were degraded to a level with the beasts. The origin of this unnatural and horrid power was as follows. On the conversion of the barbarous nations to Christianity, these ignorant proselytes confounded the excommunication in use among Christians with that which had been practised in the times of Paganism, and which was attended with all the dreadful effects above mentioned. The Roman pontiffs, on the other hand, were too artful not to encourage this error; and therefore employed all sorts of means to gain credit to an opinion so well calculated to gratify their ambition, and to aggrandize in general the episcopal order.

73 He becomes a temporal prince.

The annals of the French nation furnish us with the following instance of the enormous power which was at this time vested in the Roman pontiff. Pepin, who was mayor of the palace to Childeric III. king of France, and who in the exercise of that high office was possessed in reality of the royal power and authority, aspired to the titles and honours of majesty also, and formed a scheme of dethroning his sovereign. For this purpose he assembled the states in 751; and though they were devoted to the interests of this ambitious usurper, they gave it as their opinion that the bishop of Rome was previously to be consulted whether the execution of such a scheme was lawful or not. In consequence of this, ambassadors were sent by Pepin to Zachary, the reigning pontiff, with the following question, "Whether the divine law did not permit a valiant and warlike people to dethrone a pusillanimous and indolent prince who was incapable of discharging any of the functions of royalty; and to substitute in his place one more worthy to rule, and who had already rendered most important services to the state?" The situation of Zachary, who stood much in need of the succours of Pepin against the Greeks and Lombards, rendered his answer such as the usurper desired: and when this favourable decision of the Roman oracle was published in France, the unhappy Childeric was stripped of his royalty without the least opposition; and Pepin, without the smallest resistance, stepped into the throne of his master and his sovereign. This decision was solemnly confirmed by Stephen II. the successor of Zachary; who undertook a journey into France in the year 754, in order to solicit assistance against the Lombards. The pontiff at the same time dissolved the obligation of the oath of fidelity and allegiance which Pepin had sworn to Childeric, and violated by his usurpation in the year 751; and to render his title to the crown as sacred as possible, Stephen anointed and crowned him, with his wife and two sons, for the second time. This complaisance of the pope was rewarded with the exarchate of Ravenna and all its dependencies, as we have already related, See *Civil History*, N° 44. *supra*; and History of Italy.

74 His power still increases.

In the succeeding centuries, the Roman pontiffs continued to increase their power by every kind of artifice and fraud which can dishonour the heart of man; and, by continually taking advantage of the civil dissensions which prevailed throughout Italy, France, and Germany, their influence in civil affairs rose to an enormous height. The increase of their authority in religious matters was not less rapid. The wisest and most impartial among the Roman Catholic writers acknowledge, that from the time of Louis the Meek the ancient rules of ecclesiastical government were gradually changed in Europe by the counsels and instigation of the church of Rome, and new laws substituted in their place. The European princes suffered themselves to be divested of the supreme authority in religious matters, which they had derived from Charlemagne; the power of the bishops was greatly diminished, and even the authority of both provincial and general councils began to decline. The popes, elated with their overgrown prosperity, and become arrogant beyond measure by the daily accessions that were made to their authority, were eagerly bent upon establishing the maxim, That the bishop of Rome was constituted and appointed by Jesus Christ supreme legislator and judge of the church universal; and that therefore the bishops derived all their authority from him. This opinion, which they inculcated with the utmost zeal and ardour, was opposed in vain by such as were acquainted with the ancient ecclesiastical constitutions, and the government of the church in the earlier ages. In order to gain credit to this new ecclesiastical code, and to support the pretensions of the popes to supremacy, it was necessary to produce the authority of ancient deeds, in order to stop the mouths of such as were disposed to set bounds to their usurpations. The bishops of Rome were aware of this; and as those means were looked upon as the most lawful that tended best to the accomplishment of their purposes, they employed some of their most ingenious and zealous partisans in forging conventions, acts of councils, epistles, and such like records, by which it might appear, that in the first ages of the church the Roman

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Roman pontiffs were clothed with the same spiritual majesty and supreme authority which they now assumed. There were not, however, wanting among the bishops some men of prudence and sagacity, who saw through these impious frauds, and perceived the chains that were forging both for them and the church. The French bishops distinguished themselves eminently in this respect: but their opposition was soon quashed; and as all Europe was sunk in the grossest ignorance and darkness, none remained who were capable of detecting these odious impostures, or disposed to support the expiring liberty of the church.

75 Extreme insolence of the popes.

This may serve as a general specimen of the character and conduct of the pretended vicegerents of Jesus Christ to the 16th century. In the 11th century, indeed, their power seems to have risen to its utmost height. They now received the pompous titles of *Masters of the World*, and *Popes*, i. e. *universal fathers.* They presided every where in the councils by their legates, assumed the authority of supreme arbiters in all controversies that arose concerning religion or church-discipline, and maintained the pretended rights of the church against the encroachments and usurpations of kings and princes. Their authority, however, was confined within certain limits: for, on the one hand, it was restrained by sovereign princes, that it might not arrogantly aim at civil dominion; and on the other, it was opposed by the bishops themselves, that it might not arise to a spiritual despotism, and utterly destroy the privileges and liberty of synods and councils. From the time of Leo IX. the popes employed every method which the most artful ambition could suggest to remove those limits, and to render their dominion both despotic and universal. They not only aspired to the character of supreme legislators in the church, to an unlimited jurisdiction over all synods and councils whether general or provincial, to the sole distribution of all ecclesiastical honours and benefices, as divinely authorised and appointed for that purpose; but they carried their insolent pretensions so far, as to give themselves out for lords of the universe, arbiters of the fate of kingdoms and empires, and supreme rulers over the kings and princes of the earth. Hence we find instances of their giving away kingdoms, and loosing subjects from their allegiance to their sovereigns; among which the history of John king of England is very remarkable. At last they plainly assumed the whole earth as their property, as well where Christianity was preached as where it was not; and therefore, on the discovery of America and the East Indies, the pope, by virtue of this spiritual property, granted to the Portuguese a right to all the countries lying eastward, and to the Spaniards all those lying to the westward, of Cape Non in Africa, which they were able to conquer by force of arms; and that nothing might be wanting to complete their character, they pretended to be lords of the future world also, and to have a power of restraining even the divine justice itself, and remitting that punishment which the Deity hath denounced against the workers of iniquity.

76 Christianity greatly corrupted. Invocations of saints, relics, purgatory, &c introduced.

All this time the powers of superstition reigned triumphant over those remains of Christianity which had escaped the corruptions of the first four centuries. In the fifth century began the invocation of the happy souls of departed saints. Their assistance was intreated by many fervent prayers, while none stood up to oppose this preposterous kind of worship. The images of those who during their lives had acquired the reputation of uncommon sanctity, were now honoured with a particular worship in several places; and many imagined that this drew into the images the propitious presence of the saints or celestial beings which they were supposed to represent. A singular and irresistible efficacy was attributed to the bones of martyrs, and to the figure of the cross, in defeating all the attempts of Satan, removing all sorts of calamities, and in healing not only the diseases of the body, but also those of the mind. The famous Pagan doctrine concerning the *purification of departed souls* by means of a certain kind of fire, i. e. purgatory, was also confirmed and explained more fully than it had formerly been; and every one knows of how much consequence this absurd doctrine hath been to the wealth and power of the Romish clergy.

77 Introduction of the mass.

In the sixth century, Gregory the Great advanced an opinion, That all the *words* of the sacred writings were *images* of invisible and spiritual things; for which reason he loaded the churches with a multitude of ceremonies the most insignificant and futile that can be imagined; and hence arose a new and most difficult science, namely, the explication of these ceremonies, and the investigation of the causes and circumstances whence they derived their origin. A new method was contrived of administering the Lord's supper, with a magnificent assemblage of pompous ceremonies. This was called the *canon of the mass*. Baptism, except in cases of necessity, was administered only on the great festivals. An incredible number of temples was erected in honour of the saints. The places set apart for public worship were also very numerous: but now they were considered as the means of purchasing the protection and favour of the saints; and the ignorant and barbarous multitude were persuaded, that these departed spirits defended and guarded against evils and calamities of every kind, the provinces, lands, cities, and villages in which they were honoured with temples. The number of these temples was almost equalled by that of the festivals, which seem to have been invented in order to bring the Christian religion as near the model of Paganism as possible.

78 Superstition still increases.

In the seventh century, religion seemed to be altogether buried under a heap of superstitious ceremonies; the worship of the true God and Saviour of the world was exchanged for the worship of bones, bits of wood (said to be of the cross), and the images of saints. The eternal state of misery threatened in Scripture to the wicked was exchanged for the temporary punishment of purgatory; and the expressions of faith in Christ by an upright and virtuous conduct, for the augmentation of the riches of the clergy by donations to the church, and the observance of a heap of idle ceremonies. New festivals were still added; one in particular was instituted in honour of the *true cross* on which our Saviour suffered: and churches were declared to be sanctuaries to all such as fled to them, whatever their crimes might have been.

Superstition, it would seem, had now attained its highest pitch; nor is it easy to conceive a degree of ignorance and degeneracy beyond what we have already mentioned. If any thing can possibly be imagined more

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more contrary to true religion, it is an opinion which prevailed in the eighth century, namely, That Christians might appease an offended Deity by voluntary acts of mortification, or by gifts and oblations lavished on the church; and that people ought to place their confidence in the works and merits of the saints. The piety in this and some succeeding ages consisted in building and embellishing churches and chapels; in endowing monasteries and basilics; hunting after the relics of saints and martyrs, and treating them with an absurd and excessive veneration; in procuring the intercession of the saints by rich oblations, or superstitious rites; in worshipping images; in pilgrimages to those places which were esteemed holy, particularly to Palestine, &c. The genuine religion of Jesus was now utterly unknown both to clergy and people, if we except a few of its general doctrines contained in the creed. In this century also, the superstitious custom of *solitary masses* had its origin. These were celebrated by the priest alone in behalf of souls detained in purgatory, as well as upon some other occasions. They were prohibited by the laws of the church, but proved a source of immense wealth to the clergy. Under Charlemagne they were condemned by a synod assembled at Mentz, as criminal effects of avarice and sloth. A new superstition, however, still sprung up in the tenth century. It was imagined, from Rev. xx. i. that Antichrist was to make his appearance on the earth, and that soon after the world itself would be destroyed. An universal panic ensued; vast numbers of people, abandoning all their connections in society, and giving over to the churches and monasteries all their worldly effects, repaired to Palestine, where they imagined that Christ would descend from heaven to judge the world. Others devoted themselves by a solemn and voluntary oath to the service of the churches, convents, and priesthood, whose slaves they became, in the most rigorous sense of that word, performing daily their heavy tasks; and all this from a notion that the supreme Judge would diminish the severity of their sentence, and look upon them with a more favourable and propitious eye, on account of their having made themselves the slaves of his ministers. When an eclipse of the sun or moon happened to be visible, the cities were deserted, and their miserable inhabitants fled for refuge to hollow caverns, and hid themselves among the craggy rocks, and under the bending summits of steep mountains. The opulent attempted to bribe the saints and the Deity himself by rich donations conferred upon the sacerdotal tribe, who were looked upon as the immediate vicegerents of heaven. In many places, temples, palaces, and noble edifices both public and private, were suffered to decay, nay, were deliberately pulled down, from a notion that they were no longer of any use, as the final dissolution of all things was at hand. In a word, no language is sufficient to express the confusion and despair that tormented the minds of miserable mortals upon this occasion. The general delusion was indeed opposed and combated by the discerning few, who endeavoured to dispel these terrors, and to efface the notion from which they arose in the minds of the people. But their attempts were ineffectual; nor could the dreadful apprehensions of the superstitious multitude be removed before the end of the century, and this terror became one of the accidental causes of the CROISADES.

That nothing might now be wanting to complete that antichristian system of religion which had overspread all Europe, it was in the 11th century determined that divine worship should be celebrated in the Latin tongue, though now unknown throughout the whole continent. During the whole of this century, also, Christians were employed in the rebuilding and ornamenting their churches, which they had destroyed through the superstitious fear already taken notice of.

In much the same way with what is above related, or worse if possible, matters went on till the time of the reformation. The clergy were immersed in crimes of the deepest dye; and the laity, imagining themselves able to purchase pardon of their sins for money, followed the examples of their pastors without remorse. 79

79 Extravagant behaviour of the reputed saints.

The absurd principle formerly mentioned, namely, that religion consists in acts of austerity, and an unknown mental correspondence with God, produced the most extravagant and ridiculous behaviour in the devotees and reputed saints. They not only lived among the wild beasts, but also after the manner of these savage animals: they ran naked through the lonely deserts with a furious aspect, and all the agitations of madness and frenzy; they prolonged their wretched life by grass and wild herbs, avoided the sight and conversation of men, remained almost motionless in certain places for several years, exposed to the rigour and inclemency of the seasons, and towards the conclusion of their lives shut themselves up in narrow and miserable huts; and all this was considered as true piety, the only acceptable method of worshipping the Deity and attaining a share in his favour.—But of all the instances of superstitious frenzy which disgraced the times we now speak of, none was held in higher veneration, or excited more the wonder of the multitude, than that of a certain order of men who were called *Stylites* by the Greeks, and *Sancti Columnares*, or Pillar Saints, by the Latins. These were persons of a most singular and extravagant turn of mind, who stood motionless on the tops of *pillars* expressly raised for this exercise of their patience, and remained there for several years amidst the admiration and applause of the stupid populace. The inventor of this strange discipline was one *Simeon* a Syrian, who began his follies by changing the agreeable employment of a shepherd for the austerities of a monkish life. He began his devotion on the top of a pillar six cubits high; but as he increased in sanctity, he also increased the height of his pillar, till, towards the conclusion of his life, he had got up on the top of a pillar 40 cubits in height. Many of the inhabitants of Syria and Palestine, seduced by a false ambition and an utter ignorance of true religion, followed the example of this fanatic, though not with the same degree of austerity. This superstitious practice began in the fifth century, and continued in the east for 600 years. The Latins, however, had too much wisdom and prudence to imitate the Syrians and Orientals in this whimsical superstition; and when a certain fanatic, or impostor, named *Wulfilaicus*, erected one of these pillars in the country of Treves, and proposed to live on it after the manner of

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of Simeon, the neighbouring biſhops ordered it to be pulled down.

The practices of auſtere worſhip and diſcipline in other reſpects, however, gained ground throughout all parts of Chriſtendom. Monks of various kinds were to be found in every country in prodigious numbers. But though their diſcipline was at firſt exceedingly ſevere, it became gradually relaxed, and the monks gave into all the prevailing vices of the times. Other orders ſucceeded, who pretended to ſtill greater degrees of ſanctity, and to reform the abuſes of the preceding ones; but theſe in their turn became corrupted, and fell into the ſame vices they had blamed in others. The moſt violent animoſities, diſputes, and hatred, alſo reigned among the different orders of monks; and, indeed, between the clergy of all ranks and degrees, whether we conſider them as claſſed in different bodies, or as individuals of the ſame body. To enter into a detail of their wranglings and diſputes, the methods which each of them took to aggrandiſe themſelves at the expence of their neighbours, and to keep the reſt of mankind in ſubjection, would require many volumes. We ſhall only obſerve, therefore, that even the external profeſſion of the auſtere and abſurd piety which took place in the fourth and fifth centuries, continued gradually to decline. Some there were, indeed, who boldly oppoſed the torrent of ſuperſtition and wickedneſs which threatened to overflow the whole world: but their oppoſition proved fruitleſs, and all of theſe towards the era of the reformation had been either ſilenced or deſtroyed: ſo that, at that time, the pope and clergy reigned over mankind without controul, had made themſelves maſters of almoſt all the wealth in every country of Europe, and may truly be ſaid to have been the only *ſovereigns;* the reſt of the human race, even kings and princes, being only their vaſſals and ſlaves.

80 Riſe of Mahometaniſm.

While the Popiſh ſuperſtition reigned thus violently in the weſt, the abſurd doctrines of Mahomet overſpread all the eaſt. The riſe of this impoſtor is related under the article ARABIA. His ſucceſſors conquered in order to eſtabliſh the religion of their apoſtle; and thus the very name of Chriſtianity was extinguiſhed in many places where it had formerly flouriſhed. The conqueſts of the Tartars having intermingled them with the Mahometans, they greedily embraced the ſuperſtitions of that religion, which thus almoſt entirely overſpread the whole continents of Aſia and Africa; and, by the conqueſt of Conſtantinople by the Turks in 1453, was likewiſe eſtabliſhed throughout a conſiderable part of Europe.

81 State of religion in the beginning of the 16th century and ſince that time.

About the beginning of the 16th century, the Roman pontiffs lived in the utmoſt tranquillity; nor had they, according to the appearance of things at that time, any reaſon to fear an oppoſition to their authority in any reſpect, ſince the commotions which had been raiſed by the Waldenſes, Albigenſes, &c. were now entirely ſuppreſſed. We muſt, not, however, conclude, from this apparent tranquillity and ſecurity of the pontiffs and their adherents, that their meaſures were univerſally applauded. Not only private perſons, but alſo the moſt powerful princes and ſovereign ſtates, exclaimed loudly againſt the tyranny of the popes, and the unbridled licentiouſneſs of the clergy of all denominations. They demanded, therefore, a reformation of the church in its head and members, and a general council to accompliſh that neceſſary purpoſe. But theſe complaints and demands were not carried to ſuch a length as to produce any good effect; ſince they came from perſons who never entertained the leaſt doubt about the ſupreme authority of the pope in religious matters, and who, of conſequence, inſtead of attempting themſelves to bring about that reformation which was ſo ardently deſired, remained entirely inactive, or looked for redreſs to the court of Rome, or to a general council. But while the ſo much deſired reformation ſeemed to be at ſuch a great diſtance, it ſuddenly aroſe from a quarter whence it was not at all expected. A ſingle perſon, Martin Luther, a monk of the order of St Auguſtine, ventured to oppoſe himſelf to the whole torrent of papal power and deſpotiſm. This bold attempt was firſt made public on the 30th of September 1517; and notwithſtanding all the efforts of the pope and his adherents, the doctrines of Luther continued daily to gain ground. Others, encouraged by his ſucceſs, lent their aſſiſtance in the work of reformation; which at laſt produced new churches, founded upon principles quite different from that of Rome, and which ſtill continue. But for a particular account of the tranſactions of the firſt reformers, the oppoſition they met with, and the final ſettlement of the reformed churches in different nations in Europe, ſee the articles LUTHER and REFORMATION.

The ſtate of religion in other parts of the world ſeems as yet to be but little altered. Aſia and Africa are ſunk in the groſſeſt ſuperſtitions either of the Mahometan or Pagan kinds. The ſouthern continent of America, belonging to the Spaniards, continues immerſed in the moſt abſurd ſuperſtitions of Popery. The northern continent, being moſtly peopled with colonies from Great Britain, profeſſes the reformed religion. At the ſame time it muſt be owned, that ſome kind of reformation hath taken place even in Popery and Mahometaniſm themſelves. The popes have no longer that authority over ſtates and princes, even thoſe moſt bigotted to Popery, which they formerly had. Neither are the lives either of the clergy or laity ſo corrupt as they were before. The increaſe of learning in all parts of the world has contributed to cauſe men open their eyes to the light of reaſon, and this hath been attended with a proportional decreaſe of ſuperſtition. Even in Mahometan countries, that furious enthuſiaſm which formerly emboldened their inhabitants to face the greateſt dangers, hath now almoſt vaniſhed; ſo that the credit of Mahomet himſelf ſeems to have ſunk much in the eſtimation of his followers. This is to be underſtood even of the moſt ignorant and bigoted multitude; and the ſenſible part of the Turks are ſaid to incline much towards deiſm. With regard to thoſe nations which ſtill profeſs Paganiſm, the intercourſe of Europeans with them is ſo ſmall, that it is impoſſible to ſay any thing concerning them. As none of them are in a ſtate of civilization, however, it may be conjectured, that their religion is of the ſame unpoliſhed caſt with their manners; and that it conſiſts of a heap of barbarous ſuperſtitions which have been handed down among them from time immemorial, and which they continue to obſerve without knowing why or wherefore.

SECT.

Composition of History.

Sect. III. *Of the Composition of History.*

Cicero has given us the whole art of composing history, in a very short and comprehensive manner. We shall first transcribe what he says, and then consider the several parts of it in their proper order.

82 Cicero's rules.

"No one is ignorant (says he), that the first law in writing history is, Not to dare to say any thing that is false; and the next, Not to be afraid to speak the truth: that on the one hand there be no suspicion of affection, nor of prejudice on the other. These foundations are what all are acquainted with. But the superstructure consists partly in things, and partly in the style or language. The former require an order of times, and descriptions of places. And because in great and memorable events, we are desirous to know first their causes, then the actions themselves, and lastly their consequences; the historian should take notice of the springs or motives that occasioned them; and, in mentioning the facts themselves, should not only relate what was done or said, but likewise in what manner; and, in treating upon their consequences, show if they were the effects of chance, wisdom, or imprudence. Nor should he only recite the actions of great and eminent persons, but likewise describe their characters. The style ought to be fluent, smooth, and even, free from that harshness and poignancy which is usual at the bar." Thus far Cicero. A history written in this manner, and furnished with all these properties, must needs be very entertaining, as well as instructive. And perhaps few have come nearer this plan than Tacitus; though his subject is attended with this unhappy circumstance, or at least unpleasant one, that it affords us examples rather of what we ought to avoid than what to imitate. But it is the business of the historian, as well as of the philosopher, to represent both virtues and vices in their proper colours; the latter doing it by precepts, and the former by examples. Their manner is different; but the end and design of both is, or should be, the same: And therefore history has not improperly been said by some to be moral philosophy exemplified in the lives and actions of mankind.

De Orat. lib. ii. c. 15.

We shall reduce these several things mentioned by Cicero to three heads, Matter, Order, and Style; and treat upon each of them separately. But as Truth is the basis and foundation of all history, it will be necessary to consider that in the first place.

Art. I. Of Truth in History.

83 Of historic truth.

Truth is, as it were, the very life and soul of history, by which it is distinguished from fable or romance. A historian therefore ought not only to be a man of probity, but void of all passion or bias. He must have the steadiness of a philosopher, joined with the vivacity of a poet or orator. Without the former, he will be insensibly swayed by some passion to give a false colouring to the actions or characters he describes, as favour or dislike to parties or persons affect his mind. Whereas he ought to be of no party, nor to have either friend or foe while writing; but to preserve himself in a state of the greatest indifferency to all, that he may judge of things as they really are in their own nature, and not as connected with this or that person or party. And with this firm and sedate temper, a lively imagination is requisite; without which his descriptions will be flat and cold, nor will he be able to convey to his readers a just and adequate idea of great and generous actions. Nor is the assistance of a good judgment less necessary than any of the former qualities, to direct him what is proper to be said and what to be omitted, and to treat every thing in a manner suitable to its importance. And since these are the qualifications necessary for a historian, it may perhaps seem the less strange that we have so few good histories.

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But historical truth consists of two parts; one is, Not to say any thing we know to be false: Though it is not sufficient to excuse a historian in relating a falsehood that he did not know it was so when he wrote it, unless he first used all the means in his power to inform himself of the truth; for then, undoubtedly, an invincible error is as unpardonable in history as in morality. But the generality of writers in his kind content themselves with taking their accounts from hearsays, or transcribing them from others; without duly weighing the evidence on which they are founded, or giving themselves the trouble of a strict inquiry. Few will use the diligence necessary to inform themselves of the certainty of what they undertake to relate. And as the want of this greatly abates the pleasure of reading such writers, while persons read with diffidence; so nothing more recommends an historian than such industry. Thus we are informed of Thucydides, that when he wrote his history of the Peloponnesian war, he did not satisfy himself with the best accounts he could get from his countrymen the Athenians, fearing they might be partial in their own cause; but spared no expence to inform himself how the same facts were related by their enemies the Lacedemonians; that, by comparing the relations of both parties, he might better judge of the truth. And Polybius took greater pains than he, in order to write his history of the Roman affairs; for he travelled into Africa, Spain, Gaul, and other parts of the world, that by viewing the several scenes of action, and informing himself from the inhabitants, he might come at a greater certainty of the facts, and represent them in a juster light. But as an historian ought not to assert what he knows to be false; so he should likewise be cautious in relating things which are doubtful, and acquaint his readers with the evidence he goes upon in such facts, from whence they may be able to judge how far it is proper to credit them. So Herodotus tells us what things he saw himself in his travels, and what he heard from the information of the Egyptian priests and others with whom he conversed. And Curtius, in the life of Alexander, speaking of the affairs of India, ingenuously confesses, that he wrote more than he fully believed. "For (says he) I neither dare to affirm positively what I doubt of, nor can I think it proper to omit what I have been told." By such a conduct the author secures his credit, whether the things prove really true or false; and gives room for further inquiry, without imposing on his readers.

The other branch of historical truth is, Not to omit any thing that is true, and necessary to set the matter treated of in a clear and full light. In the actions of past

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past ages or distant countries, wherein the writer has no personal concern, he can have no great inducement to break in upon this rule. But where interest or party is engaged, it requires no small candour, as well as firmness of mind, constantly to adhere to it. Affection to some, aversion to others, fear of disobliging friends or those in power, will often interpose and try his integrity. Besides, an omission is less obvious to censure than a false assertion: for the one may be easily ascribed to ignorance or forgetfulness; whereas the other will, if discovered, be commonly looked upon as design. He therefore who, in such circumstances, from a generous love to truth, is superior to all motives to betray or stifle it, justly deserves the character of a brave as well as honest man. What Polybius says upon this head is very well worth remarking: "A good man ought to love his friends and his country, and to have a like disposition with them, both towards their friends and enemies. But when he takes upon him the character of a historian, they must all be forgot. He must often speak well of his enemies, and commend them when their actions deserve it; and sometimes blame, and even upbraid his greatest friends, when their conduct makes it necessary. Nor must he forbear sometimes to reprove, and at other times to commend, the same persons; since all are liable to mistake in their management, and there are scarce any persons who are always in the wrong. Therefore, in history, all personal considerations should be laid aside, and regard had only to their actions."

What a different view of mankind and their actions should we have were these rules observed by all historians? Integrity is undoubtedly the principal qualification of a historian; when we can depend upon this, other imperfections are more easily passed over. Suetonius is said to have written the lives of the first twelve Roman emperors with the same freedom wherewith they themselves lived. What better character can be given of a writer? The same ingenuous temper appears in the two Grecian historians above mentioned, Thucydides and Polybius: The former of whom, though banished by his countrymen the Athenians, yet expresses no marks of resentment in his history, either against them in general, or even against the chief authors of it, when he has occasion to mention them; and the latter does not forbear censuring what he thought blameable in his nearest relations and friends. But it is often no easy matter to know whether a historian speaks truth or not, and keeps up to the several characters here mentioned; though it seems reasonable, upon the common principles of justice due to all mankind, to credit him where no marks of partiality or prejudice appear in his writings. Sometimes, indeed, a judgment may in a good measure be formed of the veracity of an author from his manner of expressing himself. A certain candour and frankness, that is always uniform and consistent with itself, runs through their writings who have nothing in view but truth, which may be justly esteemed as a very good evidence of their sincerity. Whereas those who have partial designs to answer are commonly more close and covert; and if at other times they assume an air of openness and freedom, yet this is not constant and even, but soon followed again with the appearance of some bias and reserve: for it is very difficult to act a part long together without lying open to a discovery. And therefore, though craft and design is exceeding various, and, Proteus-like, assumes very different shapes, there are certain characters by which it may often be perceived and detected. Thus, where things are uncertain by reason of their being reported various ways, it is partiality in a historian to give into the most unfavourable account, where others are as well known and equally credible. Again, it is a proof of the same bad temper, when the facts themselves are certain and evident, but the design and motives of those concerned in them are unknown and obscure, to assign some ill principle, such as avarice, ambition, malice, interest, or any other vicious habit, as the cause of them. This conduct is not only unjust to the persons whose actions they relate; but hurtful to mankind in general, by endeavouring to destroy the principal motive to virtue, which springs from example. Others, who affect to be more covert, content themselves with suspicious and sly insinuations; and then endeavour to come off, by intimating their unwillingness to believe them, though they would have their readers do so. And to mention no more, there are others, who, when they have loaded persons with unjust calumnies and reflections, will allow them some slight commendations, to make what they have said before look more credible, and themselves less partial. But the honest and faithful historian contemns all such low and mean arts; he considers things as they are in themselves, and relates them as he finds them without prejudice or affection.

Art. II. The Subject or Argument of History.

84 Subject of history.

The *subject* in general is facts, together with such things as are either connected with them, or may at least be requisite to set them in a just and proper light. But although the principal design of history be to acquaint us with facts, yet all facts do not merit the regard of an historian; but such only as may be thought of use and service for the conduct of human life. Nor is it allowable for him, like the poet, to form the plan and scheme of his work as he pleases. His business is to report things as he finds them, without any colouring or disguise to make them more pleasing and palatable to his reader, which would be to convert his history into a novel. Indeed, some histories afford more pleasure and entertainment than others, from the nature of the things of which they consist; and it may be esteemed the happiness of an historian to meet with such a subject, but it is not his fault if it be otherwise. Thus Herodotus begins his history with showing, that the barbarians gave the first occasion to the wars between them and the Greeks, and ends it with an account of the punishment which, after some ages, they suffered from the Greeks on that account. Such a relation must not only be very agreeable to his countrymen the Grecians, for whose sakes it was written; but likewise very instructive, by informing them of the justice of Providence in punishing public injuries in this world, wherein societies, as such, are only capable of punishment. And therefore those examples might be of use to caution them against the like practices. On the contrary, Thucydides begins his history with the unhappy state of his countrymen the Athenians; and in the

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the course of it plainly intimates, that they were the cause of the calamitous war between them and the Lacedemonians. Whereas, had he been more inclined to please and gratify his countrymen than to write the truth, he might have set things in such a light as to have made their enemies appear the aggressors. But he scorned to court applause at the expence of truth and justice, and has set a noble example of integrity to all future historians. But as all actions do not merit a place in history, it requires no small judgement in an historian to select such only as are proper. Cicero observes very justly, that history "is conversant in great and memorable actions." For this reason, an historian should always keep posterity in view; and relate nothing which may not, upon some account or other, be worth the notice of after-ages. To descend to trivial and minute matters, such as frequently occur in the common affairs of life, is below the dignity of history. Such writers ought rather to be deemed journalists than historians, who have no view or expectation that their works should survive them. But the skilful historian is fired with a more noble ambition. His design is to acquaint succeeding ages with what remarkable occurrences happened in the world before them; to do justice to the memory of great and virtuous men; and at the same time to perpetuate his own. Pliny the younger has some fine reflections upon this head, in a letter to a friend. "You advise me (says he) to write an history; and not you only, for many others have done the same, and I am myself inclined to it. Not that I believe myself qualified for it, which would be rash to think till I have tried it; but because I esteem it a generous action not to suffer those to be forgotten whose memory ought to be eternised; and to perpetuate the names of others, together with one's own. For there is nothing I am so desirous or ambitious of, as to be remembered hereafter; which is a thing worthy of a man, especially of one who, conscious of no guilt, has nothing to fear from posterity. Therefore I am thinking day and night by what means, as Virgil says,

—— My name
To raise aloft:

That would suffice me; for it is above my wish to add with him,

—— and wing my flight to fame.
But oh!

Lib. v. ep. 8.

However, this is enough, and what history alone seems to promise." This was Pliny's opinion with regard to the use and advantage of history; the subjects of which are generally matters of weight and importance. And therefore, when a prudent historian thinks it convenient to take notice of things in themselves less considerable, he either does it with brevity, or for some apparent reason, or accounts for it by some just apology. So Dion Cassius, when he has mentioned some things of less moment in the life of Commodus (as indeed that emperor's life was chiefly filled up with cruelty and folly), makes this excuse for himself: "I would not have it thought that I descend below the gravity of history in writing these things: For, as they were the actions of an emperor, and I was present and saw them all, and both heard and conversed with him, I did not think it proper to omit them." He seems to think those actions, when performed by an emperor, might be worth recording, which, if done by a person of inferior rank, would scarce have deserved notice. Nor does he appear to have judged amiss, if we consider what an influence the conduct and behaviour of princes, even in the common circumstances of life, have upon all beneath them; which may sometimes render them not unworthy the regard of an historian, as examples either for imitation or caution.

But although facts in general are the proper subject of history, yet they may be differently considered with regard to the extent of them, as they relate either to particular persons or communities of men. And from this consideration history has been distinguished into three sorts, viz. *biography*, *particular* and *general history*. The lives of single persons is called *biography*. By *particular history* is meant that of particular states, whether for a shorter or longer space of time. And *general history* contains an account of several states existing together in the same period of time.

85 Different kinds of history.

1. The subjects of *biography* are the lives either of public or private persons; for many useful observations in the conduct of human life may be made from just accounts of those who have been eminent and beneficial to the world in either station. Nay, the lives of vicious persons are not without their use, as warnings to others, by observing the fatal consequences which sooner or later generally follow such practices. But for those who exposed their lives, or otherwise employed their time and labour, for the service of their fellow-creatures, it seems but a just debt that their memories should be perpetuated after them, and posterity acquainted with their benefactors. The expectation of this was no small incentive to virtue in the Pagan world. And perhaps every one, upon due reflection, will be convinced how natural this passion is to mankind in general. And it was for this reason, probably, that Virgil places not only his heroes, but also the inventors of useful arts and sciences, and other persons of distinguished merit, in the Elysian Fields, where he thus describes them:

Here patriots live, who, for their country's good,
In fighting fields were prodigal of blood;
Priests of unblemish'd lives here make abode,
And poets worthy their inspiring god;
And searching wits of more mechanic parts,
Who grac'd their age with new invented arts;
Those who to worth their bounty did extend,
And those who knew that bounty to commend:
The heads of these with holy fillets bound,
And all their temples were with garlands crown'd.
ÆNEID, vi. 66.

In the lives of public persons, their public characters are principally, but not solely, to be regarded. The world is inquisitive to know the conduct of princes and other great men, as well in private as public. And both, as has been said, may be of service, considering the influence of their examples. But to be over-inquisitive in searching into the weaknesses and infirmities of the greatest or best of men, is, to say no more of it, but a needless curiosity. In the writers of this kind, Plutarch is justly allowed to excel.

But it has been a matter of dispute among the learned,

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learned, whether any one ought to write his own history. It may be pleaded in favour of this, that no one can be so much master of the subject as the person himself: and besides, there are many instances, both ancient and modern, to justify such a conduct. But on the other hand it must be owned, that there are many inconveniences which attend it; some of which are mentioned by Cicero. "If (says he) there is any thing commendable, persons are obliged to speak of themselves with greater modesty, and to omit what is blameable in others. Besides, what is said is not so soon credited, and has less authority; and after all, many will not stick to censure it." And Pliny says very well to the same purpose, "Those who proclaim their own virtues, are thought not so much to proclaim them because they did them, as to have done them that they might proclaim them. So that which would have appeared great if told by another, is lost when related by the party himself. For when men cannot deny the fact, they reflect upon the vanity of its author. Wherefore, if you do things not worth mentioning, the actions themselves are blamed; and if the things you do are commendable, you are blamed for mentioning them."

Ad Fam. lib. v. ep. 12.

Lib. viii. ep. 1.

These reflections will be generally allowed to be very just; and yet considering how natural it is for men to love themselves, and to be inclined in their own favour, it seems to be a very difficult task for any one to write an impartial history of his own actions. There is scarce any treatise of this kind that is more celebrated than Cæsar's Commentaries. And yet Suetonius tells us, that "Asinius Pollio (who lived at that time) thought they were neither written with due care nor integrity: that Cæsar was often too credulous in his accounts of what was done by other persons; and misrepresented his own actions, either designedly, or through forgetfulness; and therefore he supposes he would have revised and corrected them." However, at some times it may doubtless be justifiable for a person to be his own historian. Plutarch mentions two cases wherein it is allowable for a man to commend himself, and be the publisher of his own merits. These are, when the doing of it may be of considerable advantage either to himself or others. It is indeed less invidious for other persons to undertake the province. And especially for a person to talk or write of his own virtues, at a time when vice and a general corruption of manners prevails, let what he says be ever so true, it will be apt at least to be taken as a reflection upon others. "Anciently (says Tacitus), many wrote their own lives, rather as a testimony of their conduct, than from pride." Upon which he makes this judicious remark: "That the more virtue abounds, the sooner the reports of it are credited." But the ancient writers had a way of taking off the reader's attention from themselves in recording their own actions, and so rendering what they said less invidious; and that was, by speaking of themselves in the third person, and not in the first. Thus Cæsar never says, "*I* did," or, "*I* said, this or that;" but always, "*Cæsar* did, or said, so and so." Why the moderns have not more chosen to follow them in this, we know not, since it seems less exceptionable.

2. In a continued history of *particular* states, some account may be given of their original, and founders; the nature of their soil, and situation; what advantages they have for their support or improvement, either within themselves, by foreign traffic, or conquests; with the form of their government. Then notice should be taken of the methods by which they increased in wealth or power, till they gradually advanced to their highest pitch of grandeur; whether by their virtue, the goodness of their constitution, trade, industry, wars, or whatever cause. After this the reasons of their declension should be shown; what were the vices that principally occasioned it (for that is generally the case); whether avarice, ambition, luxury, discord, cruelty, or several of these in conjunction. And lastly, where that has been their unhappy fate, how they received their final ruin and subversion. Most of these things Livy had in view when he wrote his history of the Roman state, as he acquaints his readers in the preface. "The accounts (says he) of what happened either before or while the city was building, consisting rather of poetical fables than any certain records of facts, I shall neither assert nor confute them. Let antiquity be allowed to make the origin of their cities more venerable, by uniting things human and divine. But if any nation may be suffered to fetch their origin from the gods, such is the military glory of the Romans, that when they represent Mars as the father of their founder, other nations may as easily acquiesce in this as they do in their government. But I lay no great stress upon these things, and others of the like nature, whatever may be thought of them. What I am desirous every one should carefully attend to, are our lives and manners: by what men, and what arts, civil and military, the empire was both acquired and enlarged: then let him observe, how our manners gradually declined with our discipline; afterwards grew worse and worse; and at length so far degenerated, that at present we can neither bear with our vices nor suffer them to be remedied. This is the chief benefit and advantage to be reaped from history, to fetch instruction from eminent examples of both kinds; in order to imitate the one, which will be of use both to yourself and your country, and avoid the other, which are equally base in their rise and event." Thus far Livy. And how well he has executed this design must be acknowledged by all who will be at the pains to peruse his work.

3. But as a particular history consists in a number of facts relating to the same state, suitably connected and laid together in a proper series; so a *general* history is made up of several particular histories, whose separate transactions within the same period of time, or part of it, should be so distinctly related as to cause no confusion. Such was the history of Diodorus Siculus, which contained an account of most of the eminent states and kingdoms in the world, though far the greatest part of it is now unhappily lost. Of the same nature is the history of Herodotus, though not so extensive; to whom we are especially indebted for the Persian affairs. And to this kind may likewise be referred Justin's history, though it be only the epitome of a larger work written by another hand. The rules proper for conducting such histories are much the same as those above mentioned concerning particular histories; excepting what relates to the *order*, of which we shall have occasion to speak hereafter.

But the histories both of particular states and those which

Compofition of Hiftory.

which are more general frequently contain only the affairs of fome fhort period of time. Thus the hiftory of the Peloponnefian war, written by Thucydides, comprifes only what was done in the firft 20 years of that war, which lafted feven years longer than his account reaches; though indeed the reafon of that might be, becaufe Thucydides died before the war was finifhed, otherwife he would very probably have continued his hiftory to the conclufion of it. But the hiftory of the war between the Romans and King Jugurtha in Africa, given us by Salluft, as alfo Cæfar's hiftories of the Gallic and civil wars, are all confined within a much lefs number of years than that of Thucydides. Nay, fometimes one fingle tranfaction is thought fufficient to furnifh out a hiftory. Such was the confpiracy of Catiline to fubvert the Roman ftate, written likewife by Salluft. As to more general hiftories, Xenophon's hiftory of Greece may be efteemed as fuch; which in order of time fucceeds that of Thucydides, and contains the affairs of 48 years. And Polybius called his a *general hiftory*; which, though it principally contained the Roman affairs, yet took in the moft remarkable tranfactions of feveral other ftates, for the fpace of 53 years: though it has met with the fame hard fate as that of Diodorus Siculus, fo that only the firft five books out of forty, of which it confifted at firft, now remain entire. And to mention no more, the celebrated hiftory of Thuanus is another inftance of this fort, in which the principal tranfactions of Europe for about 60 years, chiefly in the 16th century, are defcribed with that judgment and fidelity, and in a manner fo accurate and beautiful, that he has been thought fcarcely inferior to any of the ancient hiftorians. Now, in fuch hiftories as thefe, to go farther back than is neceffary to fet the fubject in a juft light, feems as improper as it is unneceffary.

The general fubject or argument of hiftory, in its feveral branches, may be reduced to thefe four heads; *narration*, *reflections*, *fpeeches*, and *digreffions*.

86 Of narration.

I. By *narration* is meant a defcription of facts or actions, with fuch things as are neceffarily connected with them; namely, perfons, time, place, defign, and event.

As to *actions* themfelves, it is the bufinefs of the hiftorian to acquaint his readers with the manner in which they were performed; what meafures were concerted on all fides, and how they were conducted, whether with vigilance, courage, prudence, and caution, or the contrary, according to the nature of the action; as likewife, if any unforefeen accidents fell out, by which the defigned meafures were either promoted or broken. All actions may be referred to two forts, military and civil. And as war arifes from injuftice and injuries received on one fide or the other, it is fit the reader fhould be informed who were the aggreffors. For though war is never to be defired, yet it is fometimes neceffary. In the defcription of battles, regard fhould be had equally to both parties; the number of forces, conduct of the generals, in what manner they engaged, what turns and chances happened in the engagement, either from accidents, courage, or ftratagem, and how it iffued. The like circumftances fhould all be obferved in fieges and other actions. But the moft agreeable fcene of hiftory arifes from a ftate of peace. Here the writer acquaints us with the conftitution of ftates, the nature of their laws, the manners and cuftoms of the inhabitants, the advantages of concord and unanimity, with the difadvantages of contention and difcord; the invention of arts and fciences, in what manner they were improved and cultivated, and by whom; with many other things, both pleafant and profitable in the conduct of life.

As to *perfons*, the characters of all thofe fhould be defcribed who act any confiderable part in a hiftory. This excites the curiofity of the reader, and makes him more attentive to what is faid of them; as one is more inquifitive to hear what relates to others in proportion to his knowledge of them. And it will likewife be of ufe to obferve, how their actions agree with their characters, and what were the effects of their different qualifications and abilities.

The circumftances of *time* and *place* are carefully to be regarded by an hiftorian, without which his accounts of facts will be frequently very lame and imperfect. And therefore chronology and geography feem not improperly to have been called *the two eyes of hiftory*. Befides, they very much affift the memory: for it is much eafier to remember any thing faid to be done at fuch a time, and in fuch a place, than if only related in general; nay, the remembrance of thefe often recals thofe things to mind which otherwife had been obliterated. By time is meant not only the year of any particular era or period; but likewife the feafon, as fummer or winter; and the age of particular perfons. For it is oftentimes from hence that we are principally enabled to make a juft eftimate of facts. Thus Cicero commends Pompey for undertaking and finifhing the Piratic war at a feafon of the year when other generals would not have thought it fafe to venture out at fea. This double danger, as well from the weather as the enemy, confidering the neceffity of the cafe, heightens the glory of the action; fince to have done the fame thing in fummer would not have been an equal proof of the courage and intrepidity of the general. And there is nothing more furprifing in the conquefts of Alexander than that he fhould fubdue fo large a part of the world by the time he was little more than 30 years old; an age at which few other generals have been much diftinguifhed. Had we not known this, a confiderable part of his character had been loft.

Pro Leg. Man. c. 12.

The like advantages arife from the other circumftances of place. And therefore in marches, battles, and other military actions, the hiftorian fhould take notice of the nature of the country, the paffes, rivers, diftances of places, fituation of the armies, and ftrength of the towns either by nature or art; from which the reader may the better form a judgment of the difficulties and greatnefs of any enterprife. Cæfar is generally very particular in thefe things, and feems to have thought it highly requifite in order to give his readers a juft idea of his actions. The defcriptions of countries, cities, and rivers, are likewife both ufeful and pleafant; and help us to judge of the probability of what is related concerning the temper and genius of the inhabitants, their arts, traffic, wealth, power, or whatever elfe is remarkable among them.

But an accurate hiftorian goes yet further, and confiders

Composition of History. siders the *causes* of actions, and what were the *designs* and views of those persons who were principally concerned in them. Some, as Polybius has well observed, are apt to confound the beginnings of actions with their springs and causes, which ought to be carefully separated. For the causes are often very remote, and to be looked for at a considerable distance from the actions themselves. Thus, as he tells us, some have represented Hannibal's besieging Saguntum in Spain, and passing the Ebro, contrary to a former agreement between the Romans and Carthaginians, as causes of the second Punic war. But these were only the beginnings of it. The true causes were the jealousies and fears of the Carthaginians from the growing power of the Romans; and Hannibal's inveterate hatred to them, with which he had been impressed from his infancy. For his father, whom he succeeded in the command of the Carthaginian army, had obliged him, when but nine years old, to take a most solemn oath upon an altar never to be reconciled to the Romans: and therefore he was no sooner at the head of the army, than he took the first opportunity to break with them. Again, the true springs and causes of actions are to be distinguished from such as are only feigned and pretended. For generally the worse designs men have in view, the more solicitous they are to cover them with specious pretences. It is the historian's business, therefore, to lay open and expose to view these arts of politicians. So, as the same judicious historian remarks, we are not to imagine Alexander's carrying over his army into Asia to have been the cause of the war between him and the Persians. That had its being long before. The Grecians had formerly two armies in Asia, one under Xenophon and the other commanded by Agesilaus. Now the Asiatics did not venture to oppose or molest either of these armies in their march. This made King Philip, Alexander's father, who was an ambitious prince, and aspired after universal monarchy, think it might be a practicable thing to make a conquest of Asia. Accordingly, he kept it in his view, and made preparations for it; but did not live to execute it. That was left for his son. But as King Philip could not have done this without first bringing the other states of Greece into it, his pretence to them was only to avenge the injuries they had all suffered from the Persians; though the real design was an universal government, both over them and the Persians, as appeared afterwards by the event. But in order to our being well assured of a person's real designs, and to make the accounts of them more credible, it is proper we should be acquainted with his disposition, manners, way of life, virtues, or vices; that by comparing his actions with these, we may see how far they agree and suit each other. For this reason Sallust is so particular in his description of Catiline, and Livy of Hannibal; by which it appears credible, that the one was capable of entering into such a conspiracy against his country, and the other of performing such great things as are related concerning him. But if the causes of actions lie in the dark, and unknown, a prudent historian will not trouble himself or his readers with vain and trifling conjectures, unless something very probable offers itself.

Lastly, an historian should relate the *issue* and *event* of the actions he describes. This is undoubtedly the most useful part of history; since the greatest advantage arising from it is to teach us experience from what has happened in the world before us. When we learn from the examples of others the happy effects of wisdom, prudence, integrity, and other virtues, it naturally excites us to an imitation of them, and to pursue the same measures in our own conduct. And, on the contrary, by perceiving the unhappy consequences which have followed from violence, deceit, rashness, or the like vices, we are deterred from such practices. But since the wisest and most prudent measures do not always meet with the desired success, and many cross accidents may happen to frustrate the best concerted designs; when we meet with instances of this nature, it prepares us for the like events, and keeps us from too great a confidence in our own schemes. However, as this is not commonly the case, but in the ordinary course of human affairs like causes usually produce like effects; the numerous examples of the happy consequences of virtue and wisdom recorded in history are sufficient to determine us in the choice of our measures, and to encourage us to hope for an answerable success, though we cannot be certain we shall in no instance meet with a disappointment. And therefore Polybius very justly observes, that "he who takes from history the causes, manner, and end of actions, and omits to take notice whether the event was answerable to the means made use of, leaves nothing in it but a bare amusement, without any benefit or instruction." These, then, are the several things necessary to be attended to in historical narrations; but the proper disposition of them must be left to the skill and prudence of the writer.

87 Of reflections.

II. *Reflections* made by the writers. Some have condemned these, as having a tendency to bias the reader; who should be left to draw such conclusions from the accounts of facts as he sees proper. But since all readers are not capable of doing this for themselves, what disadvantage is it for the author to suggest to them such observations as may assist them to make the best use of what they read? And if the philosopher is allowed to draw such inferences from his precepts as he thinks just and proper, why has not the historian an equal right to make reflections upon the facts he relates? The reader is equally at liberty to judge for himself in both cases, without danger of being prejudiced. And therefore we find, that the best historians have allowed themselves this liberty. It would be easy to prove this by a large number of instances, but one or two here may suffice. When Sallust has given a very distinct account of the designs of Catiline, and of the whole scheme of the conspiracy, he concludes it with this reflection: "All that time the empire of the Romans seems to me to have been in a very unhappy state. For when they had extended their conquests through the whole world from east to west, and enjoyed both peace and plenty, which mankind esteem their greatest happiness; some persons were obstinately bent upon their own ruin, and that of their country. For notwithstanding two decrees were published by the senate, not one out of so great a multitude was prevailed with, by the rewards that were offered, either to discover the conspiracy or to leave the army of Catiline. So desperate a disease, and as it were infection, had seized the minds of most people!" And it is a very handsome observation *Bell. Catil.* c. 37.

Compoſition of Hiſtory.

obſervation that Livy makes upon the ill-conduct of Hannibal in quartering his army in Capua after the battle of Cannæ; by which means they loſt their martial vigour through luxury and eaſe. "Thoſe (ſays he) who are ſkilled in military affairs reckoned this a greater fault in the general, than his not marching his army immediately to Rome after his victory at Cannæ; for ſuch a delay might have ſeemed only to defer the victory, but this ill ſtep deprived him of the power to gain it." The modeſty of the hiſtorian in this paſſage is worth remarking, in that he does not repreſent this as his own private opinion, and by that means undertake to cenſure the conduct of ſo great a general as Hannibal was, but as the ſenſe of thoſe who were ſkilled in ſuch affairs. However, a hiſtorian ſhould be brief in ſuch remarks; and conſider, that although he does not exceed his province by applauding virtue, expreſſing a juſt indignation againſt vice, and interpoſing his judgment upon the nature and conſequences of the facts he relates; yet there ought to be a difference between his reflections and the encomiums or declamations of an orator.

Lib. xxiii. c. 18.

88 Of ſpeeches.

III. *Speeches* inſerted by hiſtorians. Theſe are of two ſorts, oblique and direct. The former are ſuch as the hiſtorian recites in his own perſon, and not in that of the ſpeaker. Of this kind is that of Hannibal in Juſtin; by which he endeavours to perſuade King Antiochus to carry the ſeat of the war againſt the Romans into Italy. It runs thus: "Having deſired liberty to ſpeak, he ſaid none of the preſent counſels and deſigns pleaſed him; nor did he approve of Greece for the ſeat of the war, which might be managed in Italy to greater advantage: becauſe it was impoſſible to conquer the Romans but by their own arms, or to ſubdue Italy but by its own forces; ſince both the nature of thoſe men, and of that war, was different from all others. In other wars, it was of great importance to gain an advantage of place or time, to ravage the countries and plunder the towns; but though you gain ſome advantage over the Romans, or defeat them, you muſt ſtill fight with them when beaten. Wherefore, ſhould any one engage with them in Italy, it was poſſible for him to conquer them by their own power, ſtrength, and arms, as he himſelf had done; but ſhould he attempt it out of Italy, the ſource of their power, he would be as much deceived, as if he endeavoured to alter the courſe of a river, not at the fountain-head, but where its ſtreams were largeſt and deepeſt. This was his judgment in private, and what he had offered as his advice, and now repeated in the preſence of his friends; that all might know in what manner a war ought to be carried on againſt the Romans, who were invincible abroad, but might be conquered at home. For they might ſooner be driven out of their city than their empire, and from Italy than their provinces; having been taken by the Gauls, and almoſt ſubdued by himſelf. That he was never defeated till he withdrew out of their country; but upon his return to Carthage, the fortune of the war was changed with the place." He ſeems to intimate by this ſpeech, that the Romans were like ſome fierce and impetuous animals, which are no otherwiſe to be ſubdued than by wounding them in ſome vital part. In ſpeeches related after this manner, we are not neceſſarily to ſuppoſe the hiſtorian gives us the very words in which they were at firſt delivered, but only the ſenſe. But in direct ſpeeches, the perſon himſelf is introduced as addreſſing his audience; and therefore the words as well as the ſenſe are to be ſuited to his character. Such is the ſpeech of Eumenes, one of Alexander's captains and ſucceſſors, made to his ſoldiers when they had traiterouſly bound him in chains, in order to deliver him up to his enemy Antigonus, as we have it in the ſame writer. "You ſee, ſoldiers (ſays he), the habits and ornaments of your general, which have not been put upon me by mine enemies; that would afford me ſome comfort: it is by you, that of a conqueror I am become conquered, and of a general a captive; though you have ſworn to be faithful to me four times within the ſpace of a year. But I omit that, ſince reflections do not become perſons in calamity. One thing I intreat, that, if Antigonus muſt have my life, you would let me die among you. For it no way concerns him how or where I ſuffer, and I ſhall eſcape an ignominious death. If you grant me this, I free you from your oath, with which you have been ſo often engaged to me. Or, if ſhame reſtrains you from offering violence to me at my requeſt, give me a ſword, and ſuffer your general to do that for you without the obligation of an oath which you have ſworn to do for your general."

Lib. xxxi. c. 5.

Lib. xiv. c. 4.

But this likewiſe is a matter in which critics have been divided in their ſentiments; whether any, or what kind, of ſpeeches ought to be allowed in hiſtory. Some have thought all ſpeeches ſhould be excluded: and the reaſon given for that opinion is this; that it breaks the thread of the diſcourſe, and interrupts the reader, when he is deſirous to come to the end of an action, and know how it iſſued. This is true, indeed, when ſpeeches are either very long or too frequent; but otherwiſe they are not only entertaining, but likewiſe inſtructive. For it is of ſervice to know the ſprings and reaſons of actions; and theſe are frequently opened and explained in the ſpeeches of thoſe by whom they were performed. Others therefore have not been againſt all ſpeeches in general, but only direct ones. And this was the opinion of Trogus Pompeius, as Juſtin informs us; though he did not think fit to follow him in that opinion, when he abridged him, as we have ſeen already by the ſpeech of King Eumenes. The reaſon offered againſt direct ſpeeches is, becauſe they are not true; and truth is the foundation of all hiſtory, from which it never ought to depart. Such ſpeeches, therefore, are ſaid to weaken the credit of the writer; ſince he who will tell us that another perſon ſpoke ſuch things which he does not know that he ever did ſpeak, and in ſuch language as he could not uſe, may take the ſame liberty in repreſenting his actions. Thus, for example, when Livy gives us the ſpeeches of Romulus, the Sabine women, Brutus, and others, in the firſt ages of the Roman ſtate, both the things themſelves are imaginary, and the language wholly diſagreeable to the times in which thoſe perſons lived. Accordingly we find, that when ſeveral hiſtorians relate ſome particular ſpeech of the ſame perſon, they widely differ both in the ſubject-matter and expreſſions. So the ſpeech of Veturia, by which ſhe diſſuaded her ſon Coriolanus from beſieging Rome when he came againſt it with an army of

Lib. xxxviii. c. 3.

Compoſition of Hiſtory.

Lib. ii. c. 40. *Ant. Rom.* lib viii. c. 46. *In Coriolano.* See Voſſ. *Ars. Hiſt.* c. 20.

of Volſcians to avenge the injuries he had received, is very differently related by Livy, Dionyſius of Halicarnaſſus, and Plutarch. Such fictitious ſpeeches therefore are judged more fit for poets, who are allowed a greater liberty to indulge their fancy than hiſtorians. And if any direct ſpeeches are to be inſerted, they ſhould be ſuch only as were really ſpoken by the perſons to whom they are aſcribed, where any ſuch have been preſerved. Theſe have been the ſentiments of ſome critics both ancient and modern. However, there is ſcarce an ancient hiſtorian now extant, either Greek or Latin, who has not ſome ſpeeches, more or leſs, in his works; and thoſe not only oblique, but alſo direct. They ſeem to have thought it a neceſſary ornament to their writings: and even where the true ſpeeches might be come at, have choſen rather to give them in their own words; in order, probably, to preſerve an equality in the ſtyle. Since therefore the beſt and moſt faithful hiſtorians have generally taken this liberty, we are to diſtinguiſh between their accounts of facts and their ſpeeches. In the former, where nothing appears to the contrary, we are to ſuppoſe they adhere to truth, according to the beſt information they could get; but in the latter, that their view is only to acquaint us with the cauſes and ſprings of actions, which they chooſe to do in the form of ſpeeches, as a method moſt ornamental to the work, and entertaining to the reader: Though the beſt hiſtorians are cautious of inſerting ſpeeches, but where they are very proper, and upon ſome ſolemn and weighty occaſions. Thucydides is ſaid to have been the firſt who brought complete and finiſhed ſpeeches into hiſtory, thoſe of Herodotus being but ſhort and imperfect. And though Dionyſius of Halicarnaſſus, in his cenſure upon Thucydides, ſeems then to have diſliked that part of his conduct; yet he afterwards thought fit to imitate it in his Antiquities of Rome, where we find many not only oblique, but alſo direct ſpeeches.

Lib. iv. c. 1. *Ann.* lib. i. 73. iii. 56, 59.

What has been ſaid of ſpeeches, may likewiſe be underſtood of letters, which we ſometimes meet with in hiſtories; as that of Alexander to Darius in Quintus Curtius, thoſe of Tiberius and Druſus in Tacitus, and many others. Some letters are wholly fictitious; and in others perhaps the hiſtorian repreſents the ſubſtance of what was really ſaid, but gives it his own dreſs. Thus we find that ſhort letter of Lentulus to Catiline at the time of his conſpiracy differently related by Cicero and Salluſt. The reaſon of which ſeems to be this: That as Cicero recited it publicly to the people of Rome in his third oration againſt Catiline, it is reaſonable to imagine he did it in the very words of the letter, which he had by him; whereas Salluſt, as an hiſtorian, might think it ſufficient to give the ſenſe of it in his own words.

IV. *Digreſſions.* Theſe, if rightly managed, afford the reader both delight and profit. Like ſpeeches, they ſhould neither be too long nor frequent; leſt they interrupt the courſe of the hiſtory, and divert the reader from the main deſign of the work. But now and then to introduce a beautiful deſcription, or ſome remarkable incident, which may give light to the ſubject, is ſo far from an interruption, that it is rather a relief to the reader, and excites him to go on with greater pleaſure and attention. See further on this head, ORATORY, N°.37.

ART. III. Of ORDER.

Compoſition of Hiſtory.

Since moſt hiſtories conſiſt of an introduction and the body of the work, in each of which ſome order is requiſite, we ſhall diſcuſs them ſeparately. 89 Of order.

1. The deſign of the introduction is the ſame here as in orations. For the hiſtorian propoſes three things by his introduction, which may be called its parts; to give his reader ſome general view of the ſubject, to engage his attention, and to poſſeſs him with a candid opinion of himſelf and his performance. Some have thought this laſt unneceſſary for an hiſtorian. But if we conſider how differently mankind are apt to judge of the ſame perſons and actions, it ſeems as requiſite for an hiſtorian to be well eſteemed as an orator. And therefore we find ſome of the beſt hiſtorians have not omitted this part. Livy's introduction has been very much applauded by the learned, as a maſterpiece in its kind. It begins with an account of his deſign. "Whether (ſays he) it may anſwer any valuable end for me to write the hiſtory of the Roman affairs from the beginning of the city, I neither am certain, nor if I was ſhould I venture to declare it." Soon after he endeavours to prepare the reader's attention, by repreſenting the grandeur and uſefulneſs of the ſubject in the following words: "Either I am prejudiced in favour of my ſubject, or there never was any ſtate greater, more virtuous, and fruitful of good examples, or in which avarice and luxury had a later admittance, or poverty and thriftineſs were either more highly or longer eſteemed, they always coveting leſs the leſs they enjoyed." And then he preſently proceeds to ingratiate himſelf with his readers, and gain their favourable opinion: "Although my name is obſcure in ſo great a number of writers, yet it is a comfort that they cloud it by their fame and character. But I ſhall gain this advantage by my labour, that I ſhall be diverted for a time from the proſpect of thoſe evils which the age has ſeen for ſo many years; while my mind is wholly intent upon former times, free from all that care which gives the writer an uneaſineſs, though it cannot bias him againſt the truth." In this paſſage we ſee he endeavours to gain the good eſteem of his readers from two very powerful motives, modeſty and a ſtrict regard to truth. It may ſcarce ſeem neceſſary to obſerve, that thoſe introductions are eſteemed the beſt which are moſt natural; that is, ſuch as are taken from the ſubject-matter of the hiſtory itſelf, and cloſely connected with it. Such are thoſe of Herodotus, Thucydides, Livy, Tacitus, and others. And therefore Salluſt is greatly blamed by Quintilian on the account of his introductions, which are ſo general, that they might ſuit other hiſtories as well as thoſe to which they are prefixed. Introductions ſhould likewiſe be proportioned to the length of the work. We meet with ſome few hiſtories, in which the writers immediately enter upon their ſubject, without any introduction; as Xenophon in his Expedition of the younger Cyrus, and Cæſar in his Commentaries of the Gallic and Civil Wars. But the latter does not profeſs to write a juſt hiſtory; and therefore left himſelf more at liberty, as well in this reſpect as in ſome others.

2. But order is principally to be regarded in the body of the work. And this may be managed two ways; either by attending to the time in a chronological

Composition of History.

cal series, or the different nature and circumstances of the things contained in the history. However, as these two methods do not equally suit all subjects, we shall a little consider to what kind of histories each of them seems more properly adapted. All history then, as we have observed already, may be reduced to three sorts; *biography*, the *history of particular states*, and the *general history of several states* existing at the same time.

In biography, or the lives of particular persons, most writers follow the order of time; though some reduce them to certain general heads, as their virtues and vices, or their public and private character. Plutarch and Cornelius Nepos have taken the former method, and Suetonius the latter.

As to the history of particular states, the order of time is generally best, as being most natural and easy. And therefore it has usually been observed by the best historians, as Thucydides, Livy, and others. Tacitus, indeed, wrote two distinct works; one of which he called *Annals*, and the other *Histories*. And as in both he has kept to the order of time, critics have been at a loss to assign any other reason for these different titles, unless that in the former work he confines himself more closely to the facts themselves, and does not treat so largely upon the causes, manner, or event of them, as he has done in the latter. And even in the circumstances of facts, there is a certain order proper to be observed, for rendering the account more plain and intelligible. Thus, for instance, in the description of a battle or siege, the time should first be known, then the chief person or persons who conducted it, then the number of forces, and other requisites, afterwards the nature of the place, then the action itself, and lastly the event. But sometimes it is necessary to add the time in which several of the other circumstances happened, especially in actions of any considerable length. Where the order of these circumstances is confused, it perplexes the account, and renders it both less entertaining to the reader, and more difficult to remember.

In a general history, the order of time cannot always be preserved; though, where the actions of different communities have respect to one as the principal, they should all, as far as possible, be referred to the transactions of that state. But even here the several affairs of those different states ought to be related separately, which will necessarily occasion the anticipating some things, and postponing others, so that they cannot all stand in the order of time in which they were performed. However, Velleius Paterculus says very justly with regard to this subject, "That every entire action placed together in one view, is much better apprehended than if divided by different times." In this case, therefore, for better preserving the chronology, it is usual with historians, when they have finished any particular narrative, in passing to the next, to express the time by some short and plain transition; and sometimes to apologize for themselves, by assigning the reasons of their conduct. So Polybius, whose history is of this kind, says concerning himself: "As in writing the actions of each year, in the order of time, I endeavour to represent the affairs of the same nation together in one summary view, it is plain that inconvenience must of course attend this way of writing." Curtius professes only to write the actions of Alexander king of Macedon; but his history contains in it the principal affairs of the greatest states in the world during that period. Now although, in the course of those transactions, the war between Archelaus governor of Macedonia, and Agis king of Sparta, happened before the battle of Alexander at Arbela; yet the historian not only relates that battle first, but carries on the account of Alexander's affairs in Asia to the death of Darius without interruption; for which he gives this reason: "If I should relate the affairs of Alexander, which happened in the mean time, either in Greece or Illyricum and Thrace, each in their proper order and time, I must interrupt the affairs of Asia; which it is much better to represent together in one continued series as they fell out, to the flight and death of Darius." Such anachronisms, therefore, are nothing more than what necessarily arise sometimes from the nature of the subject: As every thing, the more complex it is, and contains under it a great number of parts, is more difficult to be digested in a regular order. But in a history composed of several states, whose affairs are independent of one another, the actions of each nation must necessarily be separated, in order to represent them in a just view, and prevent confusion. This is the method which Herodotus has taken, as likewise Diodorus Siculus and Justin. Now both the pleasure and benefit which such histories afford, arise from observing the conduct of each state separately in the course of their affairs, and then comparing one with the other. And as the order of time must frequently be interrupted, it is not unusual to continue the chronology at proper distances in relating the affairs of each nation; which preserves an unity in the whole, and connects it in one consistent body.

Lib. v. *init.*

The division of histories into books was designed only for the better distinction of the subject and ease of the reader. And the dividing these books again into chapters, is rather a practice of later editors (founded, as they have thought, on the same reasons), than countenanced by the example of ancient writers.

Art. IV. Of Style.

90 Of style.

An historical style is said to be of a middle nature, between that of a poet and an orator, differing from both not only in the ornamental parts, but likewise in the common idioms and forms of expression.

Cicero observes, that "nothing is more agreeable in history than brevity of expression, joined with purity and perspicuity." Purity indeed is not peculiar to history, but yet it is absolutely necessary; for no one will ever think him fit to write a history who is not master of the language in which he writes: and therefore when Albinus had written a history of the Roman affairs in Greek, and apologised for any slips or improprieties that might be found in the language upon the account of his being a Roman, Cato called him a trifler, for choosing to do that which, after he had done it, he was obliged to ask pardon for doing. Nor is perspicuity less requisite in an historical style. The nature of the subject plainly directs to this. For as history consists principally in narration, clearness and perspicuity are nowhere more necessary than in a relation of facts. But

De Clar. Orat. c. 75.

Gell. lib. xi. c. 8.

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But these two properties are to be accompanied with brevity, since nothing is more disagreeable than a long and tedious narrative. And in this respect an historical style differs both from that of poetry and oratory. For the poet frequently heightens and enlarges his descriptions of facts, by dwelling upon every circumstance, placing it in different views, and embellishing it with the finest ornaments of wit and language, to render his images more agreeable; and the orator often does the like, with a design to strike the passions. But such colouring is not the business of an historian, who aims at nothing more than a just and faithful representation of what he relates, in a way best suited to its nature, and in such language as is most proper to set it in a plain and easy light.

De Orat. lib. ii. c. 15. 20.

Again, Cicero, treating of an historical style, says: "It ought to be fluent, smooth, and even, free from that harshness and poignancy which is usual at the bar." The properties here mentioned distinguish this style from that of judicial discourses, in which the orator often finds it necessary to vary his manner of speaking, in order to answer different views, either of pursuing an argument, pressing an adversary, addressing a judge, or recommending the merits of his cause. This occasions an inequality in his style, while he speaks sometimes directly, at other times by way of question, and intermixes short and concise expressions with round and flowing periods. But the historian has no necessity for such variations in his style. It is his province to espouse no party, to have neither friend nor foe, but to appear wholly disinterested and indifferent to all; and therefore his language should be smooth and equal in his relations of persons and their actions.

Epist. ad Cn. Pompeium.

But further: Dionysius makes "decency a principal virtue in an historian;" which he explains by saying, that "he ought to preserve the characters of the persons and dignity of the actions of which he treats." And to do this it seems necessary that an historical style should be animated with a good degree of life and vigour; without which neither the characters of eminent persons, nor their remarkable actions, which make up the main business of history, can be duly represented: for even things in themselves great and excellent, if related in a cold and lifeless manner, often do not affect us in a degree suitable to their dignity and importance. And this seems particularly necessary in speeches, in order to represent what every one says, according to his different country, age, temper, and station of life, in the same manner we may suppose he either really did, or would have spoken himself on that occasion. Besides there are some scenes of action which require very pathetic and moving language to represent them agreeably to their nature. And in descriptions, the most beautiful tropes and lively figures are often necessary to set the ideas of things in a proper light. From whence it appears, that painting and imagery make up no small part of the historian's province, though his colours are not so strong and glittering as those either of the poet or orator. He ought therefore to be well acquainted with the manners of men and the nature of the passions, since he is often obliged to describe both; in the former of which Herodotus excels, and Thucydides in the latter, as Dionysius has observed.

Now from these several properties laid down by ancient writers, as requisite for an historical style, it seems upon the whole to agree best with the middle character. And this will further appear, by what they say relating to the ornamental parts of style; namely, composition and dignity. As to the former of these, which respects the structure of sentences, and the several parts of them, Demetrius remarks, that "An historical period ought neither to rise very high, nor sink very low, but to preserve a medium." This simplicity (he says) "becomes the gravity and credit of history; and distinguishes it from oratory on the one hand, and dialogue on the other." His meaning is, that historical periods should neither be so full and sonorous as is frequent in oratory; nor yet so short and flat as in dialogue: the former of which, as he says, require a strong voice to pronounce them; and the latter have scarce the appearance of periods. So that, according to this judicious writer, the periods best suited for history are those which, being of a moderate length, will admit of a just rise and cadency, and may be pronounced with ease. And Dionysius tells us, that "History should flow smooth and even, every where consistent with itself, without roughness or chasms in the sound." This relates to the harmony of periods, which arises from such a position of the words as renders the sound pleasant and agreeable, and as he thinks ought to be attended to in history. And as to dignity, which respects the use of tropes and figures, the same author says, that "History should be embellished with such figures as are neither vehement nor carry in them the appearance of art." This is agreeable to what Cicero observes, in comparing Xenophon and Calisthenes, two Greek historians. "Xenophon the Socratic (says he) was the first philosopher, and after him Calisthenes the scholar of Aristotle, who wrote an history: the latter almost like a rhetorician: but the style of the former is more moderate, and has not the force of an orator, less vehement perhaps, but in my opinion more sweet and pleasant." The difference between these two writers, with regard to their style, consisted chiefly in the choice of their figures: which in Xenophon were more gentle and moderate, and therefore in the judgement of Cicero more agreeable to history. Now these several properties relating to the ornaments of language, as well as those before mentioned, which by ancient writers have been thought requisite for history, are all suited to the middle style, as we have elsewhere shown at large. See Oratory, N° 99—121.

De Orat. lib. ii. c. 14.

But notwithstanding this general account of the several properties which constitute an historical style, it admits of considerable varieties from the different nature and dignity of the subject. The lives of particular persons do not require that strength and majesty of expression, nor all those ornaments of language, as an history of the Roman empire. And accordingly we find the style of Nepos and Suetonius very different from that of Livy. The former is smooth and easy, scarce rising above the low character; but the latter often approaches near to the sublime. And other historians again have kept a medium between these. Upon the whole, therefore, we may conclude, that the middle style is the proper character for history; though historians may sometimes sink into the low character, and at other times rise to the grandeur and magnificence of the sublime, from the different nature of their subject, or some particular parts of it. For that is to be esteemed the proper character of any writing which in the general best suits it. And this distinction may help us in some measure to reconcile the sentiments of writers upon this head who seem to attribute different characters to an historical style, or at least to judge where the truth lies; since a variety of style is not only requisite in different subjects, but likewise in different parts of the same work.

History of Nature, or *Natural History*. See Natural History.

HISTRIO, in the ancient drama, signified an actor or comedian; but more especially a pantomime, who exhibited his part by gestures and dancing. Livy informs us that the histriones were brought to Rome from Etruria, in the year of the city 391, (Dec. i. lib. 7.)

HISTRIX. See Hystrix.

HITCHING, a large and populous town of Hartfordshire in England, situated near a large wood called *Hitchwood*. The manor was the ancient demesne of the kings of England, as it continues at this day; and it has been the dower of several of their queens. The town is reckoned the second in the county for number of streets, houses, and inhabitants. It was formerly famous for the staple commodities of the kingdom, and divers merchants of the staple of Calais resided here, since which that trade is lost. The inhabitants now make large quantities of malt; and the market is one of the greatest in England for wheat. W. Long. 0. 10. N. Lat. 51. 58.

HITHE, or Hythe, a town of Kent in England, 70 miles from London. It is one of the cinque ports; and had formerly five parishes, but by the choking up of its harbour and other accidents is now reduced to one. In the reign of Henry IV. numbers of its inhabitants were cut off by a pestilence, 200 of their houses consumed by fire, and five of their ships sunk at sea, with the loss of 100 men; so that the people were going to abandon the town, had not the king by his charter generously released to them, for five turns next following, their service of five ships of 100 men and five horse, which they were to have furnished out and kept at their own charge in the king's wars for 15 days. It was first incorporated by the name of *barons of the town and port of Hith;* but the government was afterwards changed. It was incorporated by Queen Elizabeth with the name of the mayor, jurats, and commonalty of the town and port of Hith, who with the freemen elect the members of parliament. The mayor is chosen yearly on Candlemas-day. Here is a market on Saturdays, and fairs in July and December. From hence to Canterbury is a paved Roman military way, called *Stoney Street;* and at a little distance from hence are the remains of the walls of a castle, which included 10 acres. There is a remarkable pile of dry bones in the town, 28 feet long, 6 broad, and 8 high; they are kept in a vault under the church in as good order as books in a library, consisting of several thousand heads, arms, legs, thigh-bones, &c. some very gigantic, and appear by an inscription to be the remains of the Danes and Britons killed in a battle near this place, before the Norman conquest. From hence to Boulogne is reckoned the shortest cut to France. E. Long. 1. 10. N. Lat 51. 8.

HITTITES, the descendants of Heth. See Heth.

HIVE, in country affairs, a convenient receptacle for bees. See Apis and Bee.

HIVITES, a people descended from Canaan. They dwelt at first in the country which was afterwards possessed by the Caphtorims, or Philistines. There were Hivites likewise at Shechem and Gibeon, and consequently in the centre of the promised land; for the inhabitants of Shechem and the Gibeonites were Hivites, (Joshua xi. 19. Genesis xxxiv. 2.). Lastly, there were some beyond Jordan, at the foot of Mount Hermon (Joshua xi. 3.). Bochart is of opinion, that Cadmus, who carried a colony of Phœnicians into Greece, was an Hivite. His name, *Cadmus*, comes from the Hebrew *Keden*, "the east," because he was of the eastern part of the land of Canaan. The name of his wife *Hermione*, comes from Mount Hermon, at the foot whereof the Hivites had their dwelling. The metamorphosis of Cadmus's companions into serpents is grounded on the signification of the name *Hivites*, which in Phœnician signifies "serpents."

HOACHE, in *Natural History*, a kind of earth approaching to the nature of chalk, but harder, and feeling like soap; whence some think that it is either the same with the soap-rock of Cornwall, or very like it. The Chinese mix it with water till the liquor is of the consistence of cream, and then varnish their China ware with it.

HOADLEY, Benjamin, successively bishop of Bangor, Hereford, Salisbury, and Winchester, was born in 1676. His first preferment in the church was the rectory of St Peter le Poor, and the lectureship of St Mildred's in the Poultry. In the year 1706, he published some Remarks on the late Bishop Atterbury's sermon at the funeral of Mr Bennet, in which Dr Atterbury had, in the opinion of Mr Hoadley, laid down some dangerous propositions. Two years after, Mr Hoadley again entered the lists against this formidable antagonist; and in his *exceptions* against a sermon published by Dr Atterbury, intitled "The Power of Charity to cover Sin," he attacked the doctor with his usual strength of reasoning and dispassionate inquiry. In 1709, another dispute arose between these two learned combatants, concerning the doctrine of non-resistence, occasioned by a performance of Mr Hoadley's, intitled "The Measures of Obedience;" some positions in which Dr Atterbury endeavoured to confute in his elegant Latin sermon preached that year before the London clergy. In this debate Mr Hoadley signalized himself in so eminent a degree, that

that the honourable house of commons gave him a particular mark of their regard, by representing, in an address to the queen, the signal services he had done to the cause of civil and religious liberty.—The principles, however, which he espoused being repugnant to the general temper of those times, drew on him the virulence of a party; yet it was at this period (1710, when, as he himself expressed it, *fury seemed to be let loose upon him*) that the late Mrs Howland presented him to the rectory of Streatham in Surry, unasked, unapplied to, and without his either having seen her or been seen by her. Soon after the accession of King George I. Mr Hoadley was consecrated to the see of Bangor; and, 1717, having broached some opinions concerning the nature of Christ's kingdom, &c. he again became the object of popular clamour. At this juncture he was distinguished by another particular mark of the royal regard, by means of which the convocation was successively prorogued, and it was not permitted to sit, or do any business, till that resentment was entirely subsided. In 1721 he was translated to Hereford; and from thence, in 1723, to Salisbury. In 1734, he was translated to Winchester (on the demise of Dr Willis), and published his *Plain Account of the Sacrament*: a performance which served as a butt for his adversaries to shoot at; yet impartiality owns it to be clear, rational, and manly, written with great candour and judgment, and suited to the capacity of every serious and considerate inquirer after truth.—His latter days were embittered by a most vile instance of fraud and ingratitude. The bishop took a French priest, who pretended to abjure his religion, under his protection, with no other recommendation than that of his necessities; in return for which act of humanity, the priest found an opportunity of getting the bishop's name written by his own hand, and, causing a note of some thousand pounds to be placed before it, offered it in payment. But the bishop denying it to be his, it was brought before a court of justice, and was there found to be a gross imposition. The ungrateful villain had now recourse to a pamphlet, in which he charged the bishop with being a drunkard; and alleged that he had the note of him when he was in liquor. To this calumny the bishop made a full and nervous answer; in which he exposed the man's falsehood, and solemnly averred that he was never drunk in his whole life. The world with becoming ardour embraced his defence, and he had the happiness to find himself perfectly acquitted even of any suspicion of such a charge. As a writer, he possessed uncommon abilities. His sermons (published in 1754 and 1555) are esteemed inferior to few writings in the English language, for plainness and perspicuity, energy and strength of reasoning, and a free and masterly manner. In private life, he was naturally facetious, easy, and complying; fond of company, yet would frequently leave it for the purposes of study or devotion. He was everywhere happy; and particularly in his own family, where he took all opportunities of instructing by his influence and example. He died in 1761, aged 83. Besides the works already mentioned, he wrote, 1. Terms of Acceptance, 8vo. 2. Reasonableness of Conformity. 3. On the Sacrament. His tracts and pamphlets are extremely numerous: and the reader may see a complete catalogue of them in his life inserted in the supplement to the Biographia Britannica.

HOADLEY, *Benjamin*, M. D. son of the former, was born in 1706; and studied at Bennet college, Cambridge, under the tuition of Dr Herring afterwards archbishop of Canterbury. He took his degree in physic; and particularly applying himself to mathematical and philosophical studies, was, when very young, admitted a member of the royal society. He was made register of Hereford while his father filled that see, and was early appointed physician to his majesty's household, but died at his house in Chelsea in 1757. He wrote, 1. Three letters on the organs of respiration, 4to. 2. The Suspicious Husband, a comedy. 3. Observations on a series of electrical experiments; and, 4. *Oratio anniversaria, in Theatro Col. Med. Londin. ex Harvei instituto habita die Octob.* 1742.

HOAI-NGAN-FOU, a city of China, in the province of Hiang-nan. According to Grosier, it is situated in a marsh, and is enclosed by a triple wall. As the ground on which it stands is lower than the bed of the canal, the inhabitants live in continual dread of an inundation. The suburbs extend to the distance of a league on each side of the canal, and form at their extremity a kind of port on the river Hoang-ho. This place is very populous, and every thing in it announces an active and brisk trade. One of those great mandarins who have the inspection of the canals and navigation, and who are also obliged to supply the court with necessary provisions, resides here. This city has eleven others under its jurisdiction; two of which are of the second, and nine of the third class.

HOAR-HOUND. See MARRUBIUM, BOTANY *Index*.

HOARSENESS, in *Medicine*, a diminution of the voice, commonly attended with a preternatural asperity and roughness thereof. The parts affected are the aspera arteria and larynx. For its causes and cure, see MEDICINE *Index*.

HOBAL, in *Mythology*, an idol of the ancient Arabs, the worship of which at Mecca was destroyed by Mahomet.

HOBBES, THOMAS, a political writer, was born at Malmsbury in 1588. He was the son of a clergyman; and having completed his studies at Oxford, he was afterwards governor to the eldest son of William Cavendish earl of Devonshire. He travelled through France and Italy with that young nobleman, and at length applied himself entirely to the study of polite literature. He translated Thucydides into English; and published his translation in 1628, in order to show his countrymen, from the Athenian history, the disorders and confusions of a democratical government. In 1626 his patron the earl of Devonshire died; and in 1628 his son died also: which loss affected Mr Hobbes to such a degree, that he very willingly accepted an offer made him of going abroad a second time with the son of Sir Gervase Clifton; whom he accordingly accompanied into France, and staid there some time. But while he continued there, he was solicited to return to England, and to resume his concern for the hopes of that family to whom he had attached himself so early, and to which he owed so many and so great obligations. In 1631, the countess dowager of Devonshire desired to put the young earl under his care, who was then about the age of 13. This was very ſuitable to Mr Hobbes's inclinations, who diſcharged that truſt with great fidelity and diligence. In 1634, he republiſhed his tranſlation of Thucydides, and prefixed to it a dedication to that young nobleman, in which he gives a great character of his father, and repreſents in the ſtrongeſt terms the obligations he was under to that illuſtrious family. The ſame year he accompanied his noble pupil to Paris, where he applied his vacant hours to the ſtudy of natural philoſophy, and more eſpecially to the perfect underſtanding of mechaniſm, and the cauſes of animal motion. He had frequent converſations upon theſe ſubjects with Father Marin Merſenne; a man deſervedly famous, and who kept up a correſpondence with almoſt all the learned in Europe. From Paris he attended his pupil into Italy, where at Piſa he became known to that great aſtronomer Galileo Galilei, who communicated to him his notions very freely; and after having ſeen all that was remarkable in that country, he returned with the earl of Devonſhire into England. Afterwards, foreſeeing the civil wars, he went to ſeek a retreat at Paris; where, by the good offices of his friend Father Merſenne, he became known to the famous Renatus des Cartes, and afterwards held a correſpondence with him upon ſeveral mathematical ſubjects, as appears from the letters of Mr Hobbes publiſhed in the works of Des Cartes. But when this philoſopher printed afterwards his Meditations, wherein he attempted to eſtabliſh points of the higheſt conſequence from innate ideas, Mr Hobbes took the liberty of diſſenting from him; as did alſo the French king's mathematical profeſſor, the illuſtrious Peter Gaſſendi, with whom Mr Hobbes contracted a very cloſe friendſhip, which was not interrupted till the death of the former. In 1642, Mr Hobbes printed a few copies of his famous book *De Cive*, which, in proportion as it became known, raiſed him many adverſaries, who charged him with inſtilling principles which had a dangerous tendency. Among many illuſtrious perſons who, upon ſhipwreck of the royal cauſe, retired to France for ſafety, was Sir Charles Cavendiſh, brother to the duke of Newcaſtle, and this gentleman, being ſkilled in every branch of the mathematics, proved a conſtant friend and patron to Mr Hobbes; who, by embarking in 1645 in a controverſy about ſquaring the circle, was grown ſo famous for it, that in 1647 he was recommended to inſtruct Charles prince of Wales, afterwards King Charles II. in mathematical learning. His care in the diſcharge of this office gained him the eſteem of that prince in a very high degree: and though he afterwards withdrew his public favour to Mr Hobbes on account of his writings, yet he always retained a ſenſe of the ſervices he had done him; ſhowed him various marks of his favour after he was reſtored to his dominions; and, as ſome ſay, had his picture hanging in his cloſet. This year alſo was printed in Holland, by the care of M. Sorbiere, a ſecond and more complete edition of his book *De Cive;* to which are prefixed two Latin letters to the editor, the one by Mr Gaſſendi, the other by Father Merſenne, in commendation of it: and in 1650 was publiſhed at London a ſmall treatiſe of Mr Hobbes's, entitled, *Human Nature;* and another *De corpore politico*, or "Of the elements of the law."

All this time Mr Hobbes had been digeſting with great care and pains his religious, political, and moral principles, into a complete ſyſtem, which he called the *Leviathan*, and which was printed in Engliſh at London in 1650 and 1651. After the publication of his Leviathan he returned to England, and paſſed the ſummer commonly at his patron the earl of Devonſhire's ſeat in Derbyſhire, and ſome of his winters in town, where he had for his intimate friends ſome of the greateſt men of the age. In 1660, upon the reſtoration, he quitted the country, and came up to London, where he obtained from the king aſſurance of protection, and had an annual penſion of 100l. ſettled upon him out of the privy purſe. Yet this did not render him entirely ſafe: for, in 1666, his *Leviathan* and his treatiſe *De Cive* were cenſured by parliament; which alarmed him very much, as did alſo the bringing in of a bill into the houſe of commons to puniſh atheiſm and profaneneſs. When this ſtorm was a little blown over, he began to think of procuring a beautiful edition of his pieces that were in Latin; but finding this impracticable in England, he cauſed it to be undertaken abroad, where they were publiſhed in quarto in 1668, from the preſs of John Bleau. In 1669, he was viſited by Coſmo de Medicis, then prince, afterwards duke of Tuſcany, who gave him ample marks of his eſteem and reſpect; and having received his picture, and a complete collection of his writings, cauſed them to be repoſited, the former among his curioſities, the latter in his noble library at Florence. The like viſits he received from foreign ambaſſadors and other ſtrangers of diſtinction; who were curious to ſee a perſon whoſe ſingular opinions and numerous writings had made ſo much noiſe all over Europe. In 1672, he wrote his own life in Latin verſe, when, as he obſerves, he had completed his 84th year: and, in 1674, he publiſhed in Engliſh verſe four books of Homer's Odyſſey; which was ſo well received, that it encouraged him to undertake the whole Iliad and Odyſſey, which he likewiſe performed and publiſhed in 1675. About this time he took his leave of London, and went to ſpend the remainder of his days in Derbyſhire: where, however, he did not remain inactive, notwithſtanding his advanced age; but publiſhed from time to time ſeveral pieces, to be found in the collection of his works. He died in 1679, aged 92.

As to his character and manners, they are thus deſcribed by Dr White Kennet, in his Memoirs of the Cavendiſh family. "The earl of Devonſhire (ſays he) for his whole life entertained Mr Hobbes in his family, as his old tutor rather than as his friend or confident. He let him live under his roof in eaſe and plenty, and in his own way, without making uſe of him in any public, or ſo much as domeſtic affairs. He would frequently put off the mention of his name, and ſay, 'He was a humoriſt, and nobody could account for him.' There is a tradition in the family, of the manners and cuſtoms of Mr Hobbes, ſomewhat obſervable. His profeſſed rule of health was to dedicate the morning to his exerciſe, and the afternoon to his ſtudies. And therefore, at his firſt riſing, he walked out, and climbed any hill within his reach; or if the weather was not dry, he fatigued himſelf within doors by ſome exerciſe or other, to be in a ſweat; recommending that practice upon this opinion, that an old man had more moiſture than heat, and therefore by ſuch

ſuch motion heat was to be acquired and moiſture expelled. After this, he took a comfortable breakfaſt; and then went round the lodgings to wait upon the earl, the counteſs, and the children, and any conſiderable ſtrangers, paying ſome ſhort addreſſes to all of them. He kept theſe rounds till about 12 o'clock, when he had a little dinner provided for him, which he ate always by himſelf without ceremony. Soon after dinner he retired to his ſtudy, and had his candle with 10 or 12 pipes of tobacco laid by him; then ſhutting his door, he fell to ſmoking, thinking, and writing for ſeveral hours. He retained a friend or two at court, and eſpecially the lord Arlington, to protect him if occaſion ſhould require. He uſed to ſay, that it was lawful to make uſe of ill inſtruments to do ourſelves good: 'If I were caſt (ſays he) into a deep pit, and the devil ſhould put down his cloven foot, I would take hold of it to be drawn out by it.' After the reſtoration, he watched all opportunities to ingratiate himſelf with the king and his prime miniſters; and looked upon his penſion to be more valuable, as an earneſt of favour and protection, than upon any other account. His future courſe of life was to be free from danger. He could not endure to be left in an empty houſe. Whenever the earl removed, he would go along with him, even to his laſt ſtage, from Chatſworth to Hardwick. When he was in a very weak condition, he dared not to be left behind, but made his way upon a feather-bed in a coach, though he ſurvived the journey but a few days. He could not bear any diſcourſe of death, and ſeemed to caſt off all thoughts of it. He delighted to reckon upon longer life. The winter before he died, he made a warm coat, which he ſaid muſt laſt him three years, and then he would have ſuch another. In his laſt ſickneſs his frequent queſtions were, Whether his diſeaſe was curable? and when intimations were given, that he might have eaſe, but no remedy, he uſed this expreſſion, 'I ſhall be glad to find a hole to creep out of the world at;' which are reported to have been his laſt ſenſible words; and his lying ſome days following in a ſilent ſtupefaction, did ſeem owing to his mind more than to his body.'

The reverend Mr Granger obſerves, that Hobbes's ſtyle is incomparably better than that of any other writer in the reign of Charles I. and was for its uncommon ſtrength and purity ſcarcely equalled in the ſucceeding reign. "He has in tranſlation (ſays he) done Thucydides as much juſtice as he has done injury to Homer; but he looked upon himſelf as born for much greater things than treading in the ſteps of his predeceſſors. He was for ſtriking out new paths in ſcience, government, and religion; and for removing the land-marks of former ages. His ethics have a ſtrong tendency to corrupt our morals, and his politics to deſtroy that liberty which is the birthright of every human creature. He is commonly repreſented as a ſceptic in religion, and a dogmatiſt in philoſophy; but he was a dogmatiſt in both. The main principles of his Leviathan are as little founded in moral or evangelical truths, as the rules he has laid down for ſquaring the circle are in mathematical demonſtration. His book on human nature is eſteemed the beſt of his works."

HOBBY, the name of a hawk called by ſome authors *ſubbuteo*. See Falco, Ornithology *Index*.

It is a hawk of the lure, and not of the fiſt; and is very like the ſaker, only much leſs. It makes excellent ſport with net and ſpaniels; for when the birds ſee the hobby, they dare not commit themſelves to the wing, but lie cloſe to the ground, and ſo are taken in nets.

Hobby is alſo a name formerly given to ſtrong active horſes of a middling ſize: they are reported to have been originally natives of Ireland, and were much liked and uſed. Nags anſwer the ſame deſcription as to ſize, qualities, and employments.

HOBGOBLIN, is a name vulgarly applied to fairies or apparitions. Skinner calls the word *robgoblins*, and derives it from Robin Goodfellow, Hob being the nick-name of Robin: but Wallis and Junius, with greater probability, derive it from *hopgoblins*, *empuſæ*, becauſe they are ſuppoſed to hop without moving both their feet.

HOBLERS, or Hobilers, *Hobelarii*, in our ancient cuſtoms, were men who, by their tenure, were obliged to maintain a light horſe or hobby, for the certifying any invaſion towards the ſea-ſide.—The name was alſo uſed for certain Iriſh knights, who uſed to ſerve as light horſemen upon hobbies.

HOB-NAIL, a nail with a thick ſtrong head, uſed in ſhoeing a hobby or little horſe.

HOB-NOB, or Hab-nab, a cant word formed from *hap ne hap*, and denoting an event which happens at random or by mere chance.

HOBOO, a name given by the people of Otaheite, and in the neighbouring iſlands of the South Sea, to their ſuperfine cloth. It is the thinneſt and moſt finiſhed preparation of the aouta.

HOBSHEE coffrees, a kind of Abyſſinian ſlaves very frequent in the empire of Hindoſtan. They come moſtly from a province ſubject to the Negus of Ethiopia, called Innariah, to the ſouth of his other dominions, and bordering upon Negroland in Africa; from whence they are ſelected, and a great traffic made of them over all Mogoliſtan and Perſia; but it is chiefly from the ports of Arabia and the Red ſea that they are brought. Nothing can be imagined more ſmooth and gloſſy, and perfectly black, than their ſkin; in which they far ſurpaſs the negroes on the coaſt of Guinea; and, generally ſpeaking, have not any thing of their thick lips, though otherwiſe as woolly haired as they. They are highly valued for their courage, fidelity, and ſhrewdneſs; in which they ſo far excel, as often to riſe to poſts of great honour, and are made governors of places under the title *Siddees*.

HOBSON's-choice, a vulgar proverbial expreſſion, applied to that kind of choice in which there is no alternative. It is ſaid to be derived from the name of a carrier at Cambridge, who let out hackney horſes, and obliged each cuſtomer to take in his turn that horſe which ſtood next the ſtable door.

HOCHE, Lazarus, a republican French general. This extraordinary man, and particular favourite of fortune, was born on the 24th of June 1768, at the village of Montreuil, in the ſuburbs of Verſailles. His father, in the early part of his life, had been a ſoldier; but acted afterwards in the capacity of a menial ſervant, and was appointed to feed the hounds of Louis XV. His mother died ſoon after the birth of young Hoche, by which he was left in a great meaſure deſti-

tute,

Hoche.

tute, his aged father (then about 72) being unable to contribute to his fupport. By the humanity of an aunt, however, who kept a green ftall at Verfailles, he was refcued from abfolute beggary. She fent him to a fmall fchool, where he acquired a tolerable knowledge of reading and writing, fhewing himfelf at once the beft and moft mifchievous fcholar in the whole fchool. He was made a chorifter by the rector of St Germain-en-Laye, becaufe he found him to be a boy of a very lively difpofition. He very foon difcovered an infatiable thirft for information upon every fubject, afking queftions at thofe who were much older than himfelf, and liftening with the utmoft attention to the anfwers they returned. The ingenuity of his remarks and enquiries was often perplexing to others; but as he gradually approached towards manhood, a very remarkable change took place, both in his manners and difpofition. His loquacity was fucceeded by a mufing, contemplative turn, and he proved by the importance of his converfation, that he had not meditated in vain.

Finding that his wants grew more numerous than could be fupplied by the induftry of his aunt, he formed the commendable refolution of earning his own fubfiftence, and accordingly became a fort of affiftant in the royal ftables of Verfailles. His ardent character, however, foon found this fituation by far too degrading; he already viewed it with abhorrence; and having accidentally met with fome part of the works of Rouffeau, a fpirit of independence inftantly feized upon him. Apprehending that he might better his fituation by going abroad, to which he was ftrongly urged by a rafcal who made a prey of him, even offered him money to enable him to profecute the undertaking, and then gave him to underftand that he was now a foldier in the French guards. Hoche, finding it wholly unavailing to remonftrate, was fent at the age of 16 to join his regiment, which was then quartered at Paris. Here he found himfelf poffeffed of no more than 125 livres (about 5l. fterling), the united refult of his own economy, and the bounty he received on entering the army. Even out of this fmall fum he was obliged to treat his fellow foldiers with a breakfaft, which exhaufted his whole ftock. A military life, however, foon appeared to be exactly fuited to his difpofition, fo that he furpaffed all the other recruits in the rapidity with which he learned the manual exercife; and in a fingle month was fit for the veteran ranks.

His limbs were admirably proportioned, his drefs was always neat, and his conduct fo regular, that he was made a grenadier at the requeft of the company. He now felt the circumfcribed nature of his education, of which he was afhamed, and he determined to atchieve that by his own exertions which the penury of his relations prevented them from accomplifhing. He faw the neceffity of a command of books, and as his pay was inadequate to the purchafe of thefe, he determined to make up the deficiency by manual labour, with no fpecies of which was he ever difgufted, while it put the means of intellectual improvement within his reach. He rofe at the dawn of day, either to draw water, or trench ground for the gardeners in the vicinity of Paris; and at night he embroidered vefts and caps.

The fruits of his induftry were, at the end of the week, divided into three parts; the firft was given to the fubftitute who mounted guard for him; the fecond was devoted to the incidental expences of a convivial hour with his companions; and the third defrayed the expences of the books which he borrowed. He now turned his whole attention to the attainment of a better knowledge of his own profeffion, and even ventured to point out the radical defects of the prevailing fyftem of military tactics, and reprobated fome of the regulations which obtained in the army. In fpite, however, of the general gravity of his deportment, he was no enemy to occafional conviviality. Having once underftood that a companion had been murdered during a quarrel in the vicinity of the metropolis, he determined not to fleep till he had taken vengeance on the affaffin. Marching forth at the head of a body of his companions, to the houfe where the deed was perpetrated, he demolifhed all the windows, and deftroyed the furniture; but for this he was fentenced to three months confinement in the *black hole*. At the expiration of this period he exhibited a fpectacle truly deferving of commiferation, being deftitute of linen, clothes and fhoes, his face pale and disfigured, and in this condition he arrived at the barracks, where he was received by his companions with every demonftration of joy. He foon after fought a duel with a tyrannical corporal, of whom the whole regiment was afraid except the gallant Hoche. The latter fell, and Hoche received a deep cut in his forehead, which added greatly to his martial appearance.

Soon after this period appeared the celebrated pamphlet of Sieyes refpecting the *Third Eftate*, and almoft every Frenchman was ready to prove that he belonged to it. The guards, it is well known, took a decided part with the people; and on the 14th of July 1789, Hoche, at the head of his companions, was among the firft who feized on the Baftile. The guards were formed into the 102d, 103d, and 104th regiments, into the laft of which Hoche was admitted with the rank of fecond adjutant, when he had an opportunity of manifefting his talents in a different channel. Improper hands having obtained the adminiftration of the military hofpital of the French guards, he minutely inveftigated the ftate of the accounts, which had been veiled with ambiguity for the purpofe of deceiving. He amended the difcipline of the army, and his active talents did not pafs unrewarded. While the regiment was reviewed in the Elyfian fields, Servan, the minifter at war, was fo delighted with the platoons of Hoche's company, that he enquired who the young man was by whom it was conducted, and he beftowed on him fome flattering compliments, and in four days after fent him the *brevet* of lieutenant in the regiment of Rouergue. He left Paris on the 24th of June 1792, in order to join his regiment, then in garrifon at Thionville. General Leveneur, who held the command in the abfence of Valence, fent Lieutenant Hoche with a regiment of huffars, to procure provifions for the troops which Miranda had ordered to lay fiege to Maeftricht. This he executed with univerfal applaufe; and when the army of the Ardennes was ordered to recrofs the Meufe, Hoche fucceeded in removing the powder from the abbey of Merchen, in bringing away the military cheft of the divifion, and conducting the fick in the hofpital, when every thing appeared to be in the power of the enemy's huffars. Having fought in the capacity of *aide-de-camp* to General Leveneur, at Gutenhowen, Neerwinden, the

Hoche.

the heights of Vertrich, and at Blangen, the republican army repaffed the Dyle, breaking down the bridges; and Hoche enabled it to effect a retreat, by difputing every inch of ground along with the rear-guard.

When Dumourier threw off the difguife at the camp of Maulde, arrefting the deputies from the convention, General Leveneur entrufted to young Hoche the delicate charge of carrying the news to Paris. His conduct on this occafion was fo highly approved of by the adminiftration, that he was raifed to the rank of adjutant-general, and chief of battalion; but he declined a higher rank than captain and aid-de-camp to his patron.

When the Britifh troops and the Auftrians befieged Dunkirk, Houchard, who was ordered to cover the place, threw in fupplies under the command of Souham and Adjutant-general Hoche, the latter of whom infpired all around him with enthufiafm; keeping up the fpirits of the troops and haraffing the enemy by frequent fallies, while the right wing and centre of the befieging army were attacked by Jourdan. Hoche conftructed feveral advanced works before the place, and for fix weeks together was never in a bed. The reprefentatives with the army, as a reward for his activity, appointed him chief of brigade.

Having obtained this rank, he was fent into Auftrian Flanders, where invariable fuccefs attended all his movements. And when only 24 years of age, he was appointed commander in chief of the army of the Mozelle, which had remained for a long time inactive, and even experienced fome difgrace under Houchard. Few fcenes of action could be more inaufpicious than that upon which Hoche was now about to enter. The Auftrians and Pruffians were about 100,000 ftrong, under the command of the firft officers in Europe, which prefented a formidable front from the Upper Palatinate to the Hundfruck: and almoft every pofition might be deemed impregnable. The troops of General Hoche were nearly undifciplined, and the nature of their fituation rendered them difpirited; but their leader firft endeavoured to gain their confidence, which he conceived made a general invincible; he reftored military difcipline; inveftigated the characters and talents of his officers; and punifhed or rewarded as neceffity required.

To infpire the inhabitants on the frontiers with courage was his next object, for which purpofe he vifited the different towns in his vicinity, frequented popular focieties, and addreffed them in perfon; fo that he not only fecured a high degree of confidence, but even procured volunteers, clothes, and provifions. Having received inftructions from the committee of public fafety to raife the fiege of Bitche and Landau; he drew a number of troops from the different garrifons, and on the event of an attack on the quarter he had weakened, he gave orders to General Moreau to fhut himfelf up in Thionville, which place he was charged to defend until death. He formed fuch a general plan of operations as gave the ftrongeft evidence of his great military talents; for if the fubordinate parts of it mifcarried (which was actually the cafe) the grand object, the effecting a junction with Pichegru, who commanded the army on the Rhine, was ftill within his reach. By a fudden and formidable manœuvre, he fo aftonifhed the enemy, that they immediately quitted the Sarre, and after experiencing a defeat, retired towards the heights of Blifecaftel, with the lofs of 700 men killed upon the field. The duke of Brunfwick retreated towards Kayferlautern, at which place the whole of the Pruffian columns formed a junction. General Hoche was well aware that his great object would be attained, if he could vanquifh the enemy at this place, and therefore he began to fcale the mountains, and when he reached the plain on the top, he found them deeply intrenched. In defiance of this advantageous pofition, he determined to give them battle, and as foon as the fignal gun was fired, he advanced from the ranks, and toffing his hat in the air, he exclaimed, "Long live the republic!" The attack on his part was bold, and the defence of the enemy was obftinate; about 40,000 were engaged on each fide, but the able manner in which the duke of Brunfwick had fortified his pofition, gave him evidently the advantage. After fighting for two days, Hoche obtained little or no advantage. The ammunition of the Pruffians being exhaufted, he next day determined to carry their entrenchments at the point of the bayonet; but being informed that they had obtained a fupply during the night, he found it neceffary to retreat. But he foon after relieved Landau, and effected a junction with General Pichegru, being appointed commander in chief of both armies.

The victorious Hoche afterwards made himfelf mafter of Germerfheim; Worms and Spires opened their gates to receive him, and Fort Vauban was retaken. It was his determination to crofs the Rhine at Strafburgh, or Offendorf, and venture into the heart of Germany with 25,000 men; to which movement Pichegru was unfriendly, and had the addrefs to prevail with the reprefentatives then prefent to refufe their fanction. Robefpierre now regarded him with a jealous eye; all his plans were treated with unmerited indignity, and his arreft was refolved on. This, however, would have been a defperate attempt at the head of his victorious troops, and therefore he was offered the chief command of the army of Italy; but no fooner had he arrived at Nice than he was fent a prifoner to Paris, where he remained confined for many months, almoft entirely forgotten. Another temporary revolution procured his liberty, and Carnot confented to his being again employed, although he was far from being his warm friend.

He was appointed to the command of the army deftined to protect the coafts of Cherbourg, a fituation which by no means agreed with his difpofition; for he was often heard to exclaim "how much happier are they who fight againft the Pruffians!" His fituation was indeed difagreeable, for it was Frenchmen fighting againft Frenchmen, and he fucceeded a number of generals who had been nearly all of them degraded. His keen difcernment, enabled him to obferve that ignorance and fuperftition were at the bottom of the conteft, which made him adopt a plan of procedure very different from thofe of his predeceffors; and he made this fingular affertion to the committee of public fafety, that a "few proclamations would be productive of infinitely more effect than fixteen pounders." He checked the depredations of his own foldiers, reftored the confidence of the peafantry, and fo highly fatisfied the government, that the command of the diftrict of Breft was committed to him. So profligate and abandoned had been the conduct of his predeceffors, that he could

not

Hoche. not procure a lodging at Rennes, which he had come to protect from the insurgents, although he offered an extravagant price for it. Soon, however, was he enabled to disarm their prejudices; for instead of hunting down the priests, he allowed the celebration of the mass, ordered the clergy to be protected, and took many of the confessors into pay. These were not like the plans of so young a man; they would have done honour to one who had studied human nature much longer than he had been in existence.

We have said that he protected both the priests and the people, but he discovered no disposition to negociate with the chiefs. But the government having positively ordered him to do so, he began a treaty with Cormartin and some others, from which he was decidedly of opinion that the chief leaders might be gained over by money, and commissions in the republican army. He was accustomed to say, "with two hundred thousand livres and ten pair of epaulets, I could gain over a majority of these men; as for the rest, a cane will suffice." The chiefs imposed upon the representatives with the army, but the general was not so easily deceived. Clermont having been permitted to travel through the cantons in which he had some influence, ostensibly to put a period to hostilities, was arrested by orders of General Hoche, being taken in the act of issuing false assignats. Cormartin, another rebel chief, gave the money to the royalists which he had received from the republic, and recruited an army of Chouans in the name of Louis XVIII. Government now perceived the necessity of giving General Hoche a discretionary power, who in consequence thereof arrested Cormartin; and being apprehensive that it was the design of Decils to take possession of the arsenal of Cisay, he marched against that leader, putting him and 300 of his associates to the bayonet.

When the ill-fated expedition against Quiberon was undertaken, and an English flotilla with ten thousand emigrants made a descent, and took possession, without opposition, of Penthievre, and the peninsula it commands, Hoche having received strong reinforcements, commenced offensive operations, and determined to carry Fort Penthievre by assault. This was opposed by the engineers as by far too desperate an undertaking, who recommended a regular siege; but the general was not to be diverted from the steady execution of his purpose. Having divided his army into three columns, he marched during the night, though assailed by a dreadful tempest. The fort was discovered about the dawn of day, which poured upon them such a tremendous fire of grape shot, that two of the divisions began to retire; but a general cry of victory soon made them return. Three hundred emigrants were put to death.

His next great military project was an expedition against Guernsey and Jersey, which we are told, was rejected by the influence of Boissy d'Anglas, who was at that time a member of the committee of public safety. But having obtained the chief command of the army of the West, the whole charge of the war in La Vendee was committed to his management, to which he was resolved to put a glorious termination, presenting the deluded people with the olive branch in one hand, and the sword in the other. Having granted a pardon to all who had been deceived, he proposed to unite the armies of Cherburg, Brest, and the West, under the appellation of the army of the Coasts of the Ocean, which, by the influence of Barras, was instantly adopted. Having marched against Charette with a body of troops, that chief was seized and ordered to be executed. In passing through Sarthe, Maine, Loire, and Morbihan, with his moving columns, he gave no quarter to the chiefs; but when he beheld the ignorant peasantry in arms and at his mercy, he used to exclaim, These unfortunate people are Frenchmen! He declared the principal towns to be no longer in a state of siege, abolished martial law, dissolved military tribunals; and, after succeeding in the accomplishment of his wishes in the space of eight weeks, he was honoured with the title of *Pacificator of La Vendee*.

The next object which attracted his whole attention was the conquest of England, a country with which he appears to have been little acquainted. His plan, however, was much approved of by the minister of marine (Truguet); but every thing was wanting for the accomplishment of an undertaking so very extraordinary; and the attempt was restricted to Ireland alone. For this purpose he set out for Brest, and procured the removal of Admiral Villaret-Joyeuse, because he was inimical to his favourite project. General Hoche superintended the dock yards, hastened the public works, and prepared every thing connected with a great naval equipment. It was the declaration of Rear-admiral Bruix, who fell at Aboukir, that Hoche would become the best minister of marine that France ever beheld, if he had only a single year's experience. When every thing was in readiness for the proposed descent upon Ireland, General Hoche embarked on board the frigate *La Fraternité*, this being the first time he was ever at sea. In a gale of wind he was separated from his army, which consisted of 15,000 men; part of the fleet appeared off the coast of Ireland, and some ships entered Bantry bay, but without their general they could undertake nothing; and therefore after holding a council of war, they determined to return. General Hoche arrived some time after, but learning that the fleet had given up the enterprise, he steered back to the French coast, weeping, it is said, when he got the last sight of Ireland.

It was believed by some, that General Hoche would be disgraced on account of the total failure of this expedition; but instead of any such attempt, he was chosen to the command of the army of the Sambre and Meuse, which at different periods had been commanded by Jourdan, Kleber, and Bernadotte. The troops had continued for some time inactive, and so shocking were the excesses they had been accustomed to commit, that the officer whom he succeeded called them *a horde of robbers*. These unfavourable circumstances, however did not terrify young Hoche, who commenced his labours with the reformation of the officers; he then bettered the situation of the men; attended to the very minutiæ of the service, and he cast an eagle's eye on the conduct of the commissaries. Being also entrusted with the administration of the conquered countries, he appointed a board of five members, to redress all grievances which might be brought before it.

Having signified to the enemy that the armistice was at an end, he dispatched a courier to the directory to inform

inform them, "that he was now ready with a body of 86,000 men, to proceed towards the Danube, and force the enemy to make peace on such terms as might be advantageous to the republic." He according began his march, crossed the Rhine without any difficulty, and occupied the heights of Neuwied. He then pursued the enemy to Dierdorff, which they were forced to abandon, while he encamped at Montabaur and Altenkirchen. The Austrians at this time lost 1000 men killed, and 8000 prisoners, with a vast quantity of baggage and ammunition. This victorious career was stopped by the news of an armistice concluded between Bonaparte in Italy and the emperor.

He once more turned his attention to the invasion of Ireland, to prepare for which he visited Paris, and afterwards went to Holland; but while he was marching a body of troops to Brest, the defeat of the Dutch fleet under Admiral De Winter completely frustrated his designs. But as the directory was at a loss for a general of character in the metropolis, Hoche was made choice of, afterwards appointed minister at war, and favoured with the unlimited confidence of Barras. But as it was suspected that Hoche was too young to hold that important office, the council of five hundred sent a message to the executive power to receive information upon this point, during which General Hoche resigned, and set off for Charleville, where he had stationed a body of troops for the purpose, it was believed, of marching to Paris. These orders being countermanded, he set off for his head quarters. Although the royalist party was gaining ground in the legislature, and the general's health rapidly on the decline, he determined to celebrate the memorable 10th of August with great pomp and magnificence. He dispached two confidential officers, Cherin and Angereau, to assist in the revolution which took place in a few days after their arrival in Paris, while he himself was labouring under a mortal distemper. He refused to comply with the advice of his physicians; and when a messenger arrived with intelligence respecting the events of the 18th *Fructidor*, he rose from his bed with this exclamation, "the republic triumphs!"

Soon after this he was appointed to command the army on the Rhine, on which he repaired immediately to Strasburgh. At this place his malady increased, and perceiving that his end was fast approaching, he prepared to meet it with undaunted fortitude. He died on the 26th of September 1797.

HOCUS-POCUS, a cant expression with which the exhibitors of legerdemain tricks generally prefaced their feats. They are thought to be derived from that arch legerdemain trick of the Romish priests converting the sacramental bread into Deity; in which wonderful metamorphosis the words *hoc est corpus* made a conspicuous part of the ceremony, and which words may be considered as the probable root of our modern *hocus-pocus*.

HOD, a sort of tray for carrying mortar, in use among bricklayers.

HODEGOS, a term purely Greek, ὁδηγος, signifying *guide*. The word is chiefly used as the title of a book composed by Anastasius the Sinate, towards the close of the fifth century; being a method of disputing against the heretics, particularly the Acephali.

Mr Toland has also published a dissertation under the same title. Its subject is the pillar of fire, &c. which went before the Israelites as a guide in the desert.

HODGE-PODGE. See HOTCH-POT.

HODMAN, a cant term formerly used for a young scholar admitted from Westminster-school to be student in Christ-church in Oxford.

HODY, HUMPHRY, a learned English divine, was born in 1659. At 21 years of age, he published his celebrated Dissertation against Aristeus's history of the 70 interpreters; which was received with great applause by all the learned, Isaac Vossius excepted, who could not bear to have his opinions opposed by such a youth. Twenty years after, he treated the subject more fully in a work entitled, *De Bibliorum textibus originalibus, versionibus Græcis, et Latina vulgata, libri IV*. In 1689, he wrote the *Prolegomena* to John Melala's Chronicle, printed at Oxford; and the year after was made chaplain to Dr Stillingfleet bishop of Worcester. The deprivation of the nonjuring bishops engaged him in a controversy with Mr Dodwell; which recommended him to Archbishop Tillotson, to whom, and his successor Dr Tennison, he was domestic chaplain. In 1698 he was made regius professor of the Greek tongue at Oxford, and archdeacon of Oxford in 1704. On occasion of the controversy about the convocation, he, in 1701, published A History of English councils and convocations, and of the clergy's sitting in parliament, &c. He died in 1706, leaving in MS. An Account of those learned Grecians who retired to Italy on the taking of Constantinople, &c. which was published in 1742 by Dr Jebb.

HOE, or HOW, a husbandman's tool, made like a cooper's adz, to cut up weeds in gardens, fields, &c. This instrument is of great use, and ought to be much more employed than it is in hacking and clearing the several corners and patches of land in spare times of the year, which would be no small advantage to it.

Horse-HOE, a large kind of hoe drawn by horses, and used to stir the intervals in the new husbandry, and clear the corn from weeds. See AGRICULTURE.

HOEING, in the new husbandry, is the breaking or dividing the soil by tillage while the corn or other plants are growing thereon.—It differs from common tillage (which is always performed before the corn or plants are sown or planted) in the time of performing it; and it is much more beneficial to the crop than any other tillage. This sort of tillage is performed various ways, and by means of different instruments, as described under the article AGRICULTURE.

HOEI-TCHEOU, the most southern city of the province of Kiang-nan in China, and one of the richest of the empire. The people are economical and temperate, but they are active and enterprising in trade; they boast of their tea, varnish, and engravings, which are indeed the most esteemed in China. It has dependent upon it six cities of the third class; the mountains which surround this canton contain gold, silver, and copper mines.

HOEMATOPUS, a genus of birds of the order of grallæ. See ORNITHOLOGY *Index*.

HOFFMAN, the name of several eminent physicians; of whom Maurice Hoffman, and John Maurice Hoffman his son, practised at Altorf. Maurice died in 1698, leaving behind him many works; and was succeeded fucceeded by his fon John Maurice, who wrote as well as his father, and died in 1727, highly efteemed by the faculty.—Frederic Hoffman, probably of the fame family, was born at Magdeburg in 1660. The principal known circumftances of his life are, his journey into Holland and England, where he became intimately acquainted with Paul Herman and Robert Boyle, never taking any fees, being fupported by his annual ftipend; his curing the emperor Charles VI. and Frederic I. king of Pruffia of inveterate difeafes; to which may be added, his accurate knowledge of the nature and virtues of mineral waters. He furvived his 80th year, and his works, which are in great efteem, were printed in fix volumes folio at Geneva, in 1740.

HOFFMANISTS, in ecclefiaftical hiftory, denote thofe who efpoufed the fentiments of Daniel Hoffman, profeffor of the univerfity of Helmftadt, who, from the year 1598, maintained, that philofophy was a mortal enemy to religion, and that what was true in philofophy was falfe in theology. Thefe abfurd and pernicious tenets occafioned a warm and extenfive controverfy: at length Hoffman was compelled by Julius duke of Brunfwick to retract his invectives againft philofophy, and to acknowledge, in the moft open manner, the harmony and union of found philofophy with true and genuine theology.

HOG. See SUS, MAMMALIA *Index*.

HOG, on board of a fhip, is a fort of flat fcrubbing broom, formed by inclofing a number of fhort twigs of birch or fuch wood between two pieces of plank faftened together, and cutting off the ends of the twigs; and ferving to fcrape the filth from a fhip's bottom under water, particularly in the act of boottopping. For this purpofe they fit to this broom a long ftaff with two ropes; one of which is ufed to thruft the hog under the fhip's bottom, and the other to guide and pull it up again clofe to the planks. This bufinefs is commonly performed in the fhip's boat, which is confined as clofe as poffible to the veffel's fide during the operation, and fhifted from one part of the fide to another till the whole is completed.

Hog's Dung is by Mortimer reckoned one of the richeft manures we are acquainted with, and the next in value to fheep's dung; and is found to be equal in virtue to twice the quantity of any other dung except this. The ancients feem to have been difpleafed with it on account of its breeding weeds; but this is only accufing it of being too rich, for any dung will do this when laid too thick. It is an excellent manure for pafture-grounds, and excels all other kinds of dung for trees. The farmers who ufe this dung for their lands, generally take care to fave it, by well-paving the ftyes; and increafe the quantity by throwing in bean-ftalks, ftubble, and many other things of a like nature: and, by good management of this kind, many farmers have procured 50 or 60 loads of excellent manure a-year out of a fmall ftye. The very beft way of ufing this dung is by mixing it with horfe-dung; and for this reafon it is beft to have the ftye near the ftable, that the two cleanfings may be mixed in one heap, and ufed together.

They have in many parts of Staffordfhire a poor, light, fhallow land, on which they fow a kind of white pea: the land is neither able to bear this nor any thing elfe to advantage for their reaping: but when the peas are ripe, they turn in as many hogs as the quantity of peafe will fatten, fuffering them to live at large, and to remain there day and night: in confequence of this, the land will produce good crops of hay for feveral years afterwards; or, if too poor for that, it will at worft raife grafs enough to make it good pafture-ground.

Hog's Lard. See AXUNGIA, MATERIA MEDICA *Index*.

HOGARTH, WILLIAM, a truly great and original genius, is faid by Dr Burn to have been the defcendant of a family originally from Kirkby Thore, in Weftmoreland. His father, who had been a fchoolmafter in the fame county, went early to London, where he was employed as a corrector of the prefs; and appears to have been a man of fome learning, a dictionary in Latin and Englifh, which he compofed for the ufe of fchools, being ftill exifting in MS. He married in London, and kept a fchool in Ship-Court, in the Old Bailey. Our hero was born in 1697 or 1698, in the parifh of St Martin, Ludgate. The outfet of his life, however, was unpromifing. "He was bound," fays Mr Walpole, "to a mean engraver of arms on plate." Hogarth probably chofe this occupation, as it required fome fkill in drawing: to which his genius was particularly turned, and which he contrived affiduoufly to cultivate. His mafter, it fince appears, was Mr Ellis Gamble, a filverfmith of eminence, who refided in Cranburn-ftreet, Leicefter-fields. In this profeffion it is not unufual to bind apprentices to the fingle branch of engraving arms and cyphers on every fpecies of metal; and in that particular department of the bufinefs young Hogarth was placed; "but, before his time was expired, he felt the impulfe of genius, and that it directed him to painting." During his apprenticefhip, he fet out one Sunday, with two or three companions, on an excurfion to Highgate. The weather being hot, they went into a public houfe, where they had not been long before a quarrel arofe between fome perfons in the fame room. One of the difputants ftruck the other on the head with a quart pot, and cut him very much. The blood running down the man's face, together with the agony of the wound, which had diftorted his features into a moft hideous grin, prefented Hogarth, who fhowed himfelf thus early "apprifed of the mode Nature had intended he fhould purfue," with too laughable a fubject to be overlooked. He drew out his pencil, and produced on the fpot one of the moft ludicrous figures that ever was feen. What rendered this piece the more valuable was, that it exhibited an exact likenefs of the man, with the portrait of his antagonift, and the figures in caricature of the principal perfons gathered round him.

How long he continued in obfcurity we cannot exactly learn; but the firft piece in which he diftinguifhed himfelf as a painter is fuppofed to have been a reprefentation of Wanftead Affembly. The figures in it, we are told, were drawn from the life, and without any circumftances of burlefque. The faces were faid to be extremely like, and the colouring rather better than in fome of his late and more highly finifhed performances. From the date of the earlieft plate that can

Hogarth. can be aſcertained to be the work of Hogarth, it may be preſumed that he began buſineſs on his own account at leaſt as early as 1720.

His firſt employment ſeems to have been the engraving of arms and ſhop bills. The next was to deſign and furniſh plates for bookſellers. Mr Bowles, at the Black Horſe in Cornhill, was one of his earlieſt patrons, whoſe prices were very low. His next friend in that line was Mr Philip Overton, who paid him ſomewhat better for his labour and ingenuity.

There are ſtill many family pictures by Hogarth exiſting, in the ſtyle of ſerious converſation-pieces. What the prices of his portraits were, Mr Nichols ſtrove in vain to diſcover; but he ſuſpects they were originally very low, as the people who are beſt acquainted with them chooſe to be ſilent on that ſubject.

It happened, in the early part of Hogarth's life, that a nobleman who was uncommonly ugly and deformed came to ſit to him for his picture. It was executed with a ſkill that did honour to the artiſt's abilities; but the likeneſs was rigidly obſerved, without even the neceſſary attention to compliment or flattery. The peer, diſguſted at this counterpart of his dear ſelf, never once thought of paying for a reflector that would only inſult him with his deformities. Some time was ſuffered to elapſe before the artiſt applied for his money; but afterwards many applications were made by him (who had then no need of a banker) for payment without ſucceſs. The painter, however, at laſt hit upon an expedient, which he knew muſt alarm the nobleman's pride, and by that means anſwer his purpoſe. It was couched in the following card: "Mr Hogarth's dutiful reſpects to Lord ——; finding that he does not mean to have the picture which was drawn for him, is informed again of Mr H's neceſſity for the money; if, therefore, his lordſhip does not ſend for it in three days, it will be diſpoſed of, with the addition of a tail, and ſome other little appendages, to Mr Hare, the famous wild-beaſt man; Mr H. having given that gentleman a conditional promiſe of it for an exhibition-picture on his lordſhip's refuſal." This intimation had the deſired effect. The picture was ſent home, and committed to the flames.

Mr Walpole has remarked, that if our artiſt "indulged his ſpirit of ridicule in perſonalities, it never proceeded beyond ſketches and drawings;" and wonders "that he never, without intention, delivered the very features of any identical perſon." Mr Nicholas aſſures us, from unqueſtionable authority, that almoſt all the perſonages who attend the levee of the Rake were undoubted portraits; and that in "Southwark Fair," and the "Modern Midnight Converſation," as many more were diſcoverable. While Hogarth was painting the "Rake's Progreſs," he had a ſummer reſidence at Iſleworth; and never failed to queſtion the company who came to ſee theſe pictures, if they knew for whom one or another figure was deſigned. When they gueſſed wrong, he ſet them right.

The duke of Leeds has an original ſcene in the "Beggar's Opera," painted by Hogarth. It is that in which Lucy and Polly are on their knees, before their reſpective fathers, to intercede for the life of the hero of the piece. All the figures are either known or ſuppoſed to be portraits. If we are not miſinformed, the late Sir Thomas Robinſon (perhaps better known by the name of Long Sir Thomas) is ſtanding in one of the ſide-boxes. Macheath, unlike his ſpruce repreſentative on our preſent ſtage, is a ſlouching bully; and Polly appears happily diſencumbered of ſuch a hoop as the daughter of Peachum within our younger memories has worn. Mr Walpole has a picture of a ſcene in the ſame piece, where Macheath is going to execution. In this alſo the likeneſſes of Walker, and Miſs Fenton, afterwards ducheſs of Bolton (the firſt and original Macheath and Polly) are preſerved. In the year 1726, when the affair of Mary Tofts, the rabbit-breeder of Godalming, engaged the public attention, a few of our principal ſurgeons ſubſcribed their guinea a-piece to Hogarth, for an engraving from a ludicrous ſketch he had made on that very popular ſubject. This plate, amongſt other portraits, contains that of the St André, then anatomiſt to the royal houſehold, and in high credit at a ſurgeon. In 1727, Hogarth agreed with Morris, an upholſterer, to furniſh him with a deſign on canvas, repreſenting the element of earth as a pattern for tapeſtry. The work not being performed to the ſatisfaction of Morris, he refuſed to pay for it; and our artiſt, by a ſuit at law, recovered the money.

In 1730, Mr Hogarth married the only daughter of Sir James Thornhill, by whom he had no child. This union, indeed, was a ſtolen one, and conſequently without the approbation of Sir James, who, conſidering the youth of his daughter, then barely 18, and the ſlender finances of her huſband, as yet an obſcure artiſt, was not eaſily reconciled to the match. Soon after this period, however, he began his "Harlot's Progreſs" (the coffin in the laſt plate is inſcribed Sept. 2. 1731); and was adviſed by Lady Thornhill to have ſome of the ſcenes in it placed in the way of his father-in-law. Accordingly, one morning early, Mrs Hogarth undertook to convey ſeveral of them into his dining-room. When he aroſe, he inquired from whence they came; and being told by whom they were introduced, he cried out, "Very well; the man who can furniſh repreſentations like theſe can alſo maintain a wife without a portion." He deſigned this remark as an excuſe for keeping his purſe-ſtrings cloſe; but, ſoon after, became both reconciled and generous to the young people. An allegorical ceiling by Sir James Thornhill is at the houſe of the late Mr Huggins, at Headly Park, Hants. The ſubject of it is the ſtory of Zephyrus and Flora; and the figure of a ſatyr and others were painted by Hogarth.

In 1732, Hogarth ventured to attack Mr Pope, in a plate called "The Man of Taſte;" containing a view of the Gate of Burlington-houſe, with Pope white-waſhing it and beſpattering the duke of Chandos's coach. This plate was intended as a ſatire on the tranſlator of Homer, Mr Kent the architect, and the earl of Burlington. It was fortunate for Hogarth that he eſcaped the laſh of the former. Either Hogarth's obſcurity at that time was his protection, or the bard was too prudent to exaſperate a painter who had already given ſuch proof of his abilities for ſatire.

Soon after his marriage, Hogarth had ſummer lodgings at South Lambeth: and being intimate with Mr Tyres, contributed to the improvement of the Spring Gardens at Vauxhall, by the hint of embelliſhing them with paintings, ſome of which were the ſuggeſtions of his

his own truly comic pencil. For his assistance, Mr Tyres gratefully presented him with a gold ticket of admission for himself and his friends.

In 1733, his genius became conspicuously known. The third scene of his "Harlot's Progress" introduced him to the notice of the great. At a board of treasury which was held a day or two after the appearance of that print, a copy of it was shown by one of the lords, as containing, among other excellencies, a striking likeness of Sir John Gonson. It gave universal satisfaction: from the treasury each lord repaired to the print-shop for a copy of it, and Hogarth rose completely into fame.

The ingenious Abbé Du Bos has often complained that no history-painter of his time went through a series of actions, and thus, like an historian, painted the successive fortune of an hero from the cradle to the grave. What Du Bos wished to see done, Hogarth performed. He launches out his young adventurer a simple girl upon the town, and conducts her through all the vicissitudes of wretchedness to a premature death. This was painting to the understanding and to the heart; none had ever before made the pencil subservient to the purposes of morality and instruction: a book like this is fitted to every soil and every observer, and he that runs may read. Nor was the success of Hogarth confined to his persons. One of his excellencies consisted in what may be termed the furniture of his pieces; for as, in sublime and historical representations, the fewer trivial circumstances are permitted to divide the spectator's attention from the principal figures, the greater is their force; so, in scenes copied from familiar life, a proper variety of little domestic images contributes to throw a degree of verisimilitude on the whole. "The Rake's levee-room," says Mr Walpole, "the nobleman's dining-room, the apartments of the husband and wife in Marriage à la Mode, the alderman's parlour, the bed-chamber, and many others, are the history of the manners of the age."

In 1745, Hogarth sold about 20 of his capital pictures by auction; and in the same year acquired additional reputation by the six prints of "Marriage à la Mode," which many be regarded as the ground-work of a novel called "the Marriage Act," by Dr Shebbeare, and of "The Clandestine Marriage."

Soon after the peace of Aix la Chapelle, he went over to France, and was taken into custody at Calais while he was drawing the gate of that town; a circumstance which he has recorded in his picture, entitled, "O the Roast Beef of Old England!" published March 26. 1749. He was actually carried before the governor as a spy, and after a very strict examination committed a prisoner to Gransire, his landlord, on his promising that Hogarth should not go out of his house till he was to embark for England.

In 1753, he appeared to the world in the character of an author, and published a quarto volume, entitled, "The Analysis of Beauty, written with a view of fixing the fluctuating ideas of taste." In this performance he shows, by a variety of examples, that a curve is the line of beauty, and that round swelling figures are most pleasing to the eye; and the truth of his opinion has been countenanced by subsequent writers on the subject. In this work, the leading idea of which was hieroglyphically thrown out in a frontispiece to his works in 1745, he acknowledges himself indebted to his friends for assistance, and particularly to one gentleman for his corrections and amendments of at least a third part of the *wording*. This friend was Dr Benjamin Hoadley the physician, who carried on the work to about the third part, Chap. IX. and then, through indisposition, declined the friendly office with regret. Mr Hogarth applied to his neighbour Mr Ralph; but it was impossible for two such persons to agree, both alike vain and positive. He proceeded no farther than about a sheet, and they then parted friends, and seem to have continued such. The kind office of finishing the work, and superintending the publication, was lastly taken up by Dr Morell, who went through the remainder of the book. The preface was in like manner corrected by the reverend Mr Townley. The family of Hogarth rejoiced when the last sheet of the "Analysis" was printed off; as the frequent disputes he had with his coadjutors, in the progress of the work, did not much harmonize his disposition. This work was translated into German by Mr Mylins, when in England, under the author's inspection; and the translation was printed in London, price five dollars. A new and correct edition was in 1754 proposed for publication at Berlin, by Ch. Fr. Vok, with an explanation of Mr Hogarth's satirical prints, translated from the French; and an Italian translation was published at Leghorn in 1761.

Hogarth had one failing in common with most people who attain wealth and eminence without the aid of liberal education.—He affected to despise every kind of knowledge which he did not possess. Having established his fame with little or no obligation to literature, he either conceived it to be needless, or decried it because it lay out of his reach. His sentiments, in short, resembled those of Jack Cade, who pronounced sentence on the clerk of Chatham because he could write and read. Till, in evil hour, this celebrated artist commenced author, and was obliged to employ the friends already mentioned to correct his "Analysis of Beauty," he did not seem to have discovered that even spelling was a necessary qualification; and yet he had ventured to ridicule the late Mr Rich's deficiency as to this particular, in a note which lies before the Rake whose play is refused while he remains in confinement for debt. Previous to the time of which we are now speaking, one of our artist's common topics of declamation was the uselessness of books to a man of his profession. In "Beer-street," among other volumes consigned by him to the pastry-cook, we find Turnbull "on Ancient Painting;" a treatise which Hogarth should have been able to understand before he ventured to condemn. Garrick himself, however, was not more ductile to flattery. A word in praise of "Sigismunda," his favourite work, might have commanded a proof print, or forced an original sketch out of our artist's hands. The following authenticated story of our artist will also serve to show how much more easy it is to detect ill-placed or hyperbolical adulation respecting others than when applied to ourselves. Hogarth being at dinner with the great Cheselden and some other company, was told that Mr John Freke, surgeon of St Bartholomew's-hospital, a few evenings before, at Dick's coffeehouse, had asserted that Greene was

Hogarth. was as eminent in compofition as Handel. "That fellow Freke," replied Hogarth, "is always fhooting his bolt abfurdly one way or another! Handel is a giant in mufic; Greene only a light Florimel kind of a compofer."—"Aye," fays our artift's informant; "but at the fame time Mr Freke declared you were as good a portrait-painter as Vandyck."—"*There* he was in the right," adds Hogarth; "and fo by G— I am, give me my time, and let me choofe my fubject!"

A fpecimen of Hogarth's propenfity to merriment, on the moft trivial occafions, is obfervable in one of his cards requefting the company of Dr Arnold King to dine with him at the Mitre. Within a circle, to which a knife and fork are the fupporters, the written part is contained. In the centre is drawn a pye, with a mitre on the top of it; and the invitation of our artift concludes with the following fport on the Greek letters—to *Eta Beta Pi*. The reft of the infcription is not very accurately fpelt. A quibble by Hogarth is furely as refpectable as a conundrum by Swift.

In one of the early exhibitions at Spring-Gardens, a very pleafing fmall picture by Hogarth made its firft appearance. It was painted for the earl of Charlemont, in whofe collection it remains, and was entitled "Picquet, or Virtue in Danger;" and fhows us a young lady who during a *tête à tête* had juft loft all her money to a handfome officer of her own age. He is reprefented in the act of returning her a handful of bank bills, with the hope of exchanging them for a fofter acquifition and more delicate plunder. On the chimney-piece a watch cafe and a figure of Time over it, with this motto—NUNC. Hogarth has caught his heroine during this moment of hefitation, this ftruggle with herfelf, and has marked her feelings with uncommon fuccefs.

In the "Mifer's Feaft," Mr Hogarth thought proper to pillory Sir Ifaac Shard, a gentleman proverbially avaricious. Hearing this, the fon of Sir Ifaac, the late Ifaac Pacatus Shard, Efq. a young man of fpirit, juft returned from his travels, called at the painter's to fee the picture; and, among the reft, afking the Cicerone "whether that odd figure was intended for any particular perfon?" on his replying "that it was thought to be very like one Sir Ifaac Shard," he immediately drew his fword and flafhed the canvas. Hogarth appeared inftantly in great wrath: to whom Mr Shard calmly juftified what he had done, faying, "that this was a very unwarrantable licence; that he was the injured party's fon, and that he was read to defend any fuit at law;" which, however, was never inftituted.

About 1757, his brother-in-law, Mr Thornhill, refigned the place of king's ferjeant-painter in favour of Mr Hogarth.

The laft remarkable circumftance of his life was his conteft with Mr Churchill. It is faid that both met at Weftminfter-hall; Hogarth to take by his eye a ridiculous likenefs of the poet, and Churchill to furnifh a defcription of the painter. But Hogarth's print of the poet was not much efteemed, and the poet's letter to him was but little admired. Some pretend, indeed, to fay that it broke the painter's heart; but this we can from good authority fay is not true. Indeed the report falls of itfelf; for we may as well fay, that Hogarth's pencil was as efficacious as the poet's pen, Hogarth. fince neither long furvived the conteft.

It may be truly obferved of Hogarth, that all his powers of delighting were reftrained to his pencil. Having rarely been admitted into polite circles, none of his fharp corners had been rubbed off, fo that he continued to the laft a grofs uncultivated man. The flighteft contradiction tranfported him into rage. To fome confidence in himfelf he was certainly entitled; for, as a comic painter, he could have claimed no honour that would not moft readily have been allowed him; but he was at once unprincipled and variable in his political conduct and attachments. He is alfo faid to have beheld the rifing eminence and popularity of Sir Jofhua Reynolds with a degree of envy; and, if we are not mifinformed, frequently fpoke with afperity both of him and his performances. Juftice, however, obliges us to add, that our artift was liberal, hofpitable, and the moft punctual of paymafters; fo that, in fpite of the emoluments his works had procured to him, he left but an inconfiderable fortune to his widow. His plates indeed are fuch refources to her as may not fpeedily be exhaufted. Some of his domeftics had lived many years in his fervice; a circumftance that always reflects credit on a mafter. Of moft of thefe he painted ftrong likeneffes on a canvas ftill in Mrs Hogarth's poffeffion.

Of Hogarth's leffer plates many were deftroyed. When he wanted a piece of copper on a fudden, he would take any from which he had already worked off fuch a number of impreffions as he fuppofed he would fell. He then fent it to be effaced, beat out, or otherwife altered to his prefent purpofe. The plates which remained in his poffeffion were fecured to Mrs Hogarth by his will, dated Aug. 12. 1764, chargeable with an annuity of 80l. to his fifter Anne, who furvived him. When, on the death of his other fifter, fhe left off the bufinefs in which fhe was engaged, he kindly took her home, and generoufly fupported her, making her, at the fame time, ufeful in the difpofal of his prints. Want of tendernefs and liberality to his relations was not among the failings of Hogarth.

The following character of Hogarth as an artift is given by Mr Gilpin in his *Effay on Prints*. "The works of this mafter abound in true humour, and fatire which is generally well directed: they are admirable moral leffons, and a fund of entertainment fuited to every tafte; a circumftance which fhows them to be juft copies of nature. We may confider them too as valuable repofitories of the manners, cuftoms, and dreffes of the prefent age. What a fund of entertainment would a collection of this kind afford, drawn from every period of the hiftory of Britain!—How far the works of Hogarth will bear a *critical examination*, may be the fubject of a little more inquiry.

"In *defign*, Hogarth was feldom at a lofs. His invention was fertile, and his judgement accurate. An improper accident is rarely introduced, a proper one rarely omitted. No one could tell a ftory better, or make it, in all its circumftances, more intelligible. His genius, however, it muft be owned, was fuited only to *low* or *familiar* fubjects; it never foared above *common* life: to fubjects naturally fublime, or which from antiquity or other accidents borrowed dignity, he could

not

not rise. In *composition* we see little in him to admire. In many of his prints the deficiency is so great as plainly to imply a want of all principle; which makes us ready to believe, that when we do meet with a beautiful group, it is the effect of chance. In one of his minor works, the Idle Prentice, we seldom see a crowd more beautifully managed than in the last print. If the sheriff's officers had not been placed in a line, and had been brought a little lower in the picture, so as to have formed a pyramid with the cart, the composition had been unexceptionable; and yet the first print of this work is such a striking instance of disagreeable composition, that it is amazing how an artist who had any idea of beautiful forms could suffer so unmasterly a performance to leave his hands. Of the *distribution of light* Hogarth had as little knowledge as of *composition*. In some of his pieces we see a good effect, as in the *Execution* just mentioned; in which, if the figures at the right and left corners had been *kept down* a little, the light would have been beautifully distributed on the fore-ground, and a fine secondary light spread over part of the crowd. But at the same time there is so obvious a deficiency in point of effect in most of his prints, that it is very evident he had no principles. Neither was Hogarth a master in *drawing*. Of the muscles and anatomy of the head and hands he had perfect knowledge; but his trunks are often badly moulded, and his limbs ill set on; yet his figures, upon the whole, are inspired with so much life and meaning, that the eye is kept in good-humour in spite of its inclination to find fault. The author of the Analysis of Beauty, it might be supposed, would have given us more instances of *grace* than we find in the works of Hogarth; which shows strongly that theory and practice are not always united. Many opportunities his subjects naturally afford of introducing graceful attitudes, and yet we have very few examples of them. With instances of picturesque grace his works abound. Of this *expression*, in which the force of his genius lay, we cannot speak in terms too high. In every mode of it he was truly excellent. The passions he thoroughly understood, and all the effects which they produce in every part of the human frame. He had the happy art also of conveying his ideas with the same precision with which he conceived them. He was excellent too in expressing any humorous oddity which we often see stamped upon the human face. All his heads are cast in the very mould of nature. Hence that endless variety which is displayed through his works; and hence it is that the difference arises between *his* heads and the affected caricatures of those masters who have sometimes amused themselves with patching together an assemblage of features from their own ideas. Such are Spaniolet's: which, though admirably executed, appear plainly to have no archetypes in nature. Hogarth's, on the other hand, are collections of natural curiosities. The *Oxford-heads*, the *Physicians-arms*, and some of his other pieces, are expresly of this humorous kind. They are truly comic, though ill-natured effusions of mirth: more entertaining than Spaniolet's, as they are pure nature; but less innocent, as they contain ill-directed ridicule.—But the species of expression in which this master perhaps most excels, is that happy art of catching those peculiarities of art and gesture which the ridiculous part of every profession contract, and which for that reason become characteristic of the whole. His counsellors, his undertakers, his lawyers, his usurers, are all conspicuous at sight. In a word, almost every profession may see in his works that particular species of affectation which they should most endeavour to avoid. The *execution* of this master is well suited to his subjects and manner of treating them. He etches with great spirit, and never gives one unnecessary stroke."

HOGSHEAD, in commerce, a measure of capacity containing 63 gallons, $=16$ gallons in Scotland.

HOGUE, a town and cape on the north-west point of Normandy in France; near which Admiral Rook burnt the French admiral's ship called the *Rising Sun*, with 12 more large men of war, the day after the victory obtained by Admiral Russell near Cherburg in May 1692. W. Long, 2. 0. N. Lat. 49. 50.

HOIST, in sea-language, denotes the perpendicular height of a flag or ensign, as opposed to the fly, which signifies its breadth from the staff to the outer edge.

HOISTING signifies the operation of drawing up any body by the assistance of one or more tackles. Hoisting is never applied to the act of pulling up any body by the help of a single block, except in the exercise of extending the sails by drawing them upwards along the masts or stays, to which it is invariably applied.

HOKE-DAY, *Hock-day*, or *Hock-Tuesday*, in our ancient customs (*dies Martis, quem quindenam paschæ vocant*), the second Tuesday after Easter week; a solemn festival celebrated for many ages in England in memory of the great slaughter of the Danes in the time of King Ethelred, they having been in that reign almost all destroyed in one day in different parts of the kingdom, and that principally by women. This is still kept up in some counties; and the women bear the principal sway in it, stopping all passengers with ropes and chains, and exacting some small matter from them to make merry with. This day was very remarkable in former times, insomuch as to be used on the same footing with Michaelmas for a general term or time of account. We find leases without date reserving so much rent payable *ad duos anni terminos, scil. ad le* hoke-day, *& ad festum sancti Michaelis*. In the account of Magdalen college, Oxford, there is yearly an allowance *pro mulieribus hockantibus* of some manors of theirs in Hampshire; where the men hock the women on Mondays and the women hock them on Tuesdays. The meaning of it is, that on that day the women in merriment stopped the way with ropes, and pulled passengers to them, desiring something to be laid out for pious uses.

Hoke-Day Money, or *Hoke-Tuesday Money*, a tribute anciently paid the landlord, for giving his tenants and bondmen leave to celebrate hock-day, or hoke-day, in memory of the expulsion of the domineering Danes.

HO-KIEN-FOU, a city of China, and one of the principal in the province of Pe-tcheli. It has two cities of the second, and fifteen of the third class in its district, but is remarkable for nothing but the neatness of its streets.

HOLBEIN, Hans, a celebrated painter, born at Basil in Switzerland in 1498, learned the rudiments of his art from his father, who was a painter; but soon shewed his superior genius. In the town-house of

Holbein. ‖ Holcus ‖ Holder.

of Basil he painted our Saviour's Passion; and in the fish-market of the same city Death's Dance, and a Dance of Peasants, which were extremely admired; and Erasmus was so pleased with them, that he desired him to draw his picture, and was ever after his friend. He staid some years longer at Basil, till his necessities, occasioned by his own extravagance and an increasing family, made him comply with Erasmus's persuasions to go to England. In his journey he staid some days at Strasburg, where it is said he applied to a very great painter for work, who took him in, and ordered him to give a specimen of his skill. On which Holbein finished a piece with great care, and painted a fly on the most eminent part of it; after which he privately withdrew in the absence of his master, and pursued his journey, without saying any thing to any body. When the painter returned home, he was astonished at the beauty and elegance of the drawing; and especially at the fly, which he at first took for a real one, and endeavoured to remove it with his hand. He now sent all over the city for his journeyman; and after many inquiries, discovered that he had been thus deceived by the famous Holbein.—Holbein having in a manner begged his way to England, presented a letter of recommendation from Erasmus to Sir Thomas More, and also showed him Erasmus's picture.. Sir Thomas, who was then lord-chancellor, received him with all the joy imaginable, and kept him in his house between two and three years; in which time he drew Sir Thomas's picture, and those of many of his relations and friends. Holbein one day happening to mention a nobleman who had some years before invited him to England, Sir Thomas was very solicitous to know who it was. Holbein said that he had forgot his title, but remembered his face so well, that he believed he could draw his likeness; which he did so perfectly, that the nobleman, it is said, was immediately known by it. The chancellor having now adorned his apartments with the productions of this great painter, resolved to introduce him to Henry VIII. For this purpose, he invited that prince to an entertainment; having, before he came, hung up all Holbein's pieces in the great hall, in the best order, and placed in the best light. The king, on his first entrance into this room, was so charmed with the sight, that he asked whether such an artist was now alive, and to be had for money? Upon this, Sir Thomas presented Holbein to his majesty; who immediately took him into his service, and brought him into great esteem with the nobility and gentry, by which means he drew a vast number of portraits. But while he was here, there happened an affair which might have proved fatal to him, had he not been protected by the king. On the report of this painter's character, a lord of the first quality came to see him when he was drawing a figure after the life. Holbein sent to desire his lordship to defer the honour of his visit to another day: which the nobleman taking for an affront, broke open the door, and very rudely went up stairs. Holbein hearing a noise, came out of his chamber; and meeting the lord at his door, fell into a violent passion, and pushed him backwards from the top of the stairs to the bottom. However, immediately reflecting on what he had done, he escaped from the tumult he had raised, and made the best of his way to the king. The nobleman, much hurt, though not so much as he pretended, was there soon after him; and upon opening his grievance, the king ordered Holbein to ask his pardon. But this only irritated the nobleman the more, who would not be satisfied with less than his life; upon which the king sternly replied, "My lord, you have not now to do with Holbein but with me; whatever punishment you may contrive by way of revenge against him, shall certainly be inflicted on yourself. Remember, pray, my lord, that I can whenever I please make seven lords of seven ploughmen, but I cannot make one Holbein of even seven lords." Holbein died of the plague at his lodgings at Whitehall in 1554. "It is amazing (says De Piles), that a man born in Switzerland, and who had never been in Italy, should have so good a *gusto*, and so fine a genius for painting." He painted alike in every manner; in fresco, in water-colours, in oil, and in miniature. His genius was sufficiently shown in the historical style, by two celebrated compositions which he painted in the hall of the Stillyard company. He was also eminent for a rich vein of invention, which he showed in a multitude of designs which he drew for engravers, statuaries, jewellers, &c. and he had this singularity, that he painted with his left hand.

HOLCUS, Indian millet or corn, a genus of plants belonging to the polygamia class, and in the natural method ranking under the 4th order, *Gramina*. See Botany *Index*.

HOLD, the whole interior cavity or belly of a ship, or all that part of her inside which is comprehended between the floor and the lower-deck throughout her whole length.—This capacious apartment usually contains the ballast, provisions, and stores of a ship of war, and the principal part of the cargo in a merchantman. The disposition of these articles with regard to each other, naturally falls under consideration in the article Stowage; it suffices in this place to say, that the places where the ballast, water, provisions, and liquors are stowed, are known by the general name of the *hold*. The several store-rooms are separated from each other by *bulk-heads*, and are denominated according to the articles which they contain, the *sail-room*, the *bread-room*, the *fish-room*, the *spirit-room*, &c.

HOLDER, William, D. D. an English divine, was born in Nottinghamshire, educated in Pembroke-hall Cambridge, and in 1642 became rector of Blechingdon of Oxford. In 1660 he proceeded D. D. was afterwards canon of Ely, fellow of the Royal Society, canon of St Paul's, sub-dean of the royal chapel, and sub-almoner to his majesty. Dr Holder was a very accomplished scholar, and greatly distinguished himself, by making a young gentleman of rank who was born deaf and dumb, to speak. This gentleman's name was Alexander Popham, son of Colonel Edward Popham, who was some time an admiral in the service of the long parliament. The cure was performed by him in his house at Blechingdon in 1659; but Popham losing what he had been taught by Holder after he was called home to his friends, was sent to Dr Wallis, who brought him to his speech again. Holder published a book, entitled "the Elements of Speech; an essay of enquiry into the natural Production of Letters: with an appendix concerning persons that are deaf and dumb, 1669," 8vo. In the appendix he relates how soon,

ſoon, and by what methods, he brought Popham to ſpeak. In 1678, he publiſhed in 4to "a Supplement to the Philoſophical Tranſactions of July 1670, with ſome reflections on Dr Wallis's letter there inſerted." This was written to claim the glory of having taught Popham to ſpeak, which Wallis in the ſaid letter had claimed to himſelf; upon which the Doctor ſoon after publiſhed "a Defence of the Royal Society, and the Philoſophical Tranſactions, particularly thoſe of July 1670, in anſwer to the Cavils of Dr William Holder, 1678," 4to. Holder was ſkilled in the theory and practice of muſic, and wrote "a Treatiſe of the natural Grounds and Principles of Harmony, 1694," 8vo. He wrote alſo "a Diſcourſe concerning Time, with Application of the natural Day, lunar Month, and ſolar Year, &c. 1694," 8vo. He died at Amen Corner in London, January 24. 1696-7, and was buried in St Paul's.

HOLDERNESS, a diſtrict of the eaſt riding of Yorkſhire, having the German ſea on the eaſt, and the Humber on the ſouth. This diſtrict is remarkable for its rich and a large breed of horned cattle and horſes. It had the title of an earldom, now extinct.

HOLDSWORTH, Edward, a very polite and elegant ſcholar, was born about 1688, and educated at Wincheſter ſchool. He was thence elected demy of Magdalen college, Oxford, in July 1705; took the degree of M. A. in April 1711; became a college-tutor, and had many pupils. In 1715, when he was to be choſen into a fellowſhip, he reſigned his demyſhip and left the college, becauſe unwilling to ſwear allegiance to the new government. The remainder of his life was ſpent in travelling with young noblemen and gentlemen as tutor; in 1741 and 1744 he was at Rome in this capacity. He died of a fever at Lord Digby's houſe at Coleſhill in Warwickſhire, December 30. 1747. He was the author of the "Muſcipula," a poem, eſteemed a maſter-piece in its kind, and of which there is a good Engliſh tranſlation by Dr John Hoadley, in vol. 5. of Dodſley's Miſcellanies. He was the author alſo of a diſſertation, entitled "Pharſalia and Philippi; or the two Philippi in Virgil's Georgics attempted to be explained and reconciled to Hiſtory, 1741," 4to: and of "Remarks and Diſſertations on Virgil; with ſome other claſſical Obſervations, publiſhed with ſeveral notes and additional remarks by Mr Spence, 1768," 4to. Mr Spence ſpeaks of him in Polymetis, as one who underſtood Virgil in a more maſterly manner than any perſon he ever knew.

HOLORACEÆ, (from *holus*, "pot-herbs"); the name of the 12th order in Linnæus's fragments of a natural method, conſiſting of plants which are uſed for the table, and enter into the economy of domeſtic affairs. See Botany *Index*.

HOLIBUT. See Pleuronectes, Ichthyology *Index*.

HOLINESS, or sanctity; a quality which conſtitutes or denominates a perſon or thing *holy*; i. e. pure, or exempt from ſin. The word is alſo uſed in reſpect of perſons and things that are ſacred, i. e. ſet apart to the ſervice of God, and the uſes of religion.

Holiness, is alſo a title of quality attributed to the pope; as that of *majeſty* is to kings. Even kings, when writing to the pope, addreſs him under the venerable appellation of *Your Holineſs*, or *Holy Father*; in Latin, *Sanctiſſime* or *Beatiſſime Pater*. Anciently the ſame title was given to all biſhops. The Greek emperors alſo were addreſſed under the title of *Holineſs*, in regard of their being anointed with holy oil at their coronation. Du Cange adds, that ſome of the kings of England have had the ſame attribute; and that the orientals have frequently refuſed it to the pope.

HOLINGSHED, Ralph, or Raphael, was one of the humble but uſeful claſs of hiſtorians called *chronologers*. He was educated at Cambridge, according to Biſhop Tanner, and became A. M. in the year 1544. The nature and extent of his education, as well as his profeſſion, are involved in uncertainty. It ſeems probable, however, that he was ſteward to Thomas Burdett, Eſq. of Bomcote in Warwickſhire, where he died about the year 1580. He has given name to a compilation of chronicles of Engliſh hiſtory from the earlieſt times, the firſt edition of which was publiſhed at London in 1577, in two volumes folio, and the ſecond edition in three volumes, was printed about ſeven years after his death, brought down to 1586. This work, according to the teſtimony of Holingſhed himſelf, was begun by the advice of Reginald Wolfe, printer to Queen Elizabeth. Part of it was compiled by himſelf, but he received conſiderable aſſiſtance from William Harriſon, John Hooker, Abraham Fleming, Francis Thynne, and ſome others. It was continued by John Stowe after the death of Holingſhed. Some parts of the firſt edition were altered in the ſecond and third, becauſe they gave offence to Queen Elizabeth and the miniſtry, who laid many reſtrictions on the liberty of the preſs. The firſt edition of conſequence is both ſcarce and valuable; but the ſuppreſſed ſheets were afterwards printed by themſelves. The chronicles of Holingſhed, although conſidered as both tedious and vulgar, contain many important facts, which tend to illuſtrate the cuſtoms and manners of remote periods.

HOLLAND, Philemond, M. D. commonly called the tranſlator general of his age, was educated in the univerſity of Cambridge. He was for many years a ſchoolmaſter at Coventry, where he alſo practiſed phyſic. He tranſlated Livy, Pliny's Natural Hiſtory, Plutarch's Morals, Suetonius, Ammianus Marcellinus, Xenophon's Cyropædia, and Camden's Britannia, into Engliſh; and the geographical part of Speed's Theatre of Great Britain into Latin. The Britannia, to which he made many uſeful additions, was the moſt valuable of his works. It is ſurpriſing that a man of two profeſſions could find time to tranſlate ſo much; but it appears from the date of the Cyropædia, that he continued to tranſlate till he was 80 years of age. He died in 1637, aged 85. He made the following epigram upon writing a large folio with a ſingle pen:

With one ſole pen I wrote this book,
  Made of a grey gooſe quill;
A pen it was when it I took,
  And a pen I leave it ſtill.

HOLLAND, the largeſt of the ſeven United Provinces, divided into South and North Holland, the latter of which is alſo called *Weſt Frieſland*, is bounded on the weſt by the German ocean, or North ſea; to the

the east by the Zuyder-see, the province of Utrecht, and part of Guelderland; to the south by Dutch Brabant and Zealand; and to the north by the Zuyder-see. Its greatest extent from north to south, including the island of Texel, is about 90 English miles; but from east to west its extent varies from 40 to 25. To defend it against the sea, dykes have been erected at an immense expence, and innumerable canals cut to drain it, as being naturally very low and marshy. Some parts of the province are very fruitful in corn; but the greater part consists of rich pastures, wherein are kept large herds of kine, which supply them with incredible quantities of butter and cheese. Of the latter, that of Edam, in North Holland, is highly esteemed. The many rivers and canals that intersect the province are of great advantage to its commerce, but contribute to render the air foggy and unwholesome. There is a communication by water betwixt almost every town and village. Towards the middle also of the province are great numbers of turf-pits. It is so populous, that the number of the inhabitants is computed at 1,200,000. In point of cleanliness no country surpasses, and few come up to it, especially in North Holland, and that even in the villages. From the counts of Holland this province devolved, in 1436, to the dukes of Burgundy, and from them to the house of Austria, along with the other provinces. The states of Holland and West Friesland are composed of the nobility and deputies of the towns; of the latter there are 18 that send deputies to the assembly of the states, which is held at the Hague. The grand pensionary is a person of great dignity and weight in this assembly, and his office requires extraordinary abilities. There are also two councils composed of deputies, one for South and another for North Holland, who have the cognizance of the revenue and military affairs. The whole province sends one deputy from among the noblesse to the states-general, who takes precedence of all others, together with three or four more. There are two supreme courts of judicature for Holland and Zealand; viz. the great council of Holland and Zealand, and the hof or court of Holland. To these appeals lie from the towns; but the causes of noblemen come before them in the first instance. With respect to the ecclesiastical government, there is a synod held annually both in South and North Holland, of which the former contains eleven classes, and the latter six; and the ministers of both together amount to 331. In the whole province are 37 towns, eight boroughs, and 400 villages.

Soon after the commencement of the French revolution, this ill-fated country became the theatre of war, the old government was subverted, and the stadtholder having fled to England for safety, the republican rulers of France imposed a political constitution upon it according to their pleasure. The infatuated people of Holland received their conquerors with apparent, perhaps with real satisfaction at first; but we believe that experience has fatally taught them the pernicious nature of the change. As the government of France changed from directorial to consular, and from consular to imperial, that of Holland also received various modifications, till at last it was converted into a monarchy under one of Bonaparte's brothers, who claims the title of king. Of all these changes the deluded people have been obliged to be the passive spectators; for what is it which may not be established at the point of the bayonet? For a copious detail of military transactions, and the political vicissitudes which Holland has experienced in consequence of the French revolution, see the article FRANCE; and for the history, see UNITED PROVINCES.

HOLLAND, one of the divisions of Lincolnshire in England. It so much resembles the province of that name upon the continent, in most respects, being low and marshy, with the sea on one side, and canals running through it, that it must either have had its name from thence, or on the same account. On the east it has what the ancient geographers call *Æstuarium Metaris*, now the Washes, which are overflowed at high water, and part of Cambridgeshire on the south. The lower part of it is full of bogs and marshes, and has huge banks to defend it against the sea and land floods. The ground is so soft, that horses are worked unshod; and it produces plenty of grass, but little corn. The whole tract seems to have been gained from the sea; and is divided into Upper and Lower, the latter of which was impassable; but since the fens have been drained, the lands are grown more solid, and the inhabitants sow cole-seed upon them to their great profit. Though there are no stones to be found in or upon the ground, yet most of the churches are of stone. They have no fresh water but from the clouds, which is preserved in pits: but if these are deep, it soon turns brackish; and if they are shallow, they soon become dry.

New HOLLAND, the largest island in the world, reaching from 10 to 44° S. Lat. and between 110 and 154 of E. Long. from London. It received its name from having been chiefly explored by Dutch navigators. The land first discovered in those parts was called *Eendraght* (Concord) *Land*, from the name of the ship on board which the discovery was made in 1616; 24° and 25° south. In 1618, another part of this coast, nearly in 15° south, was discovered by Zeachen, who gave it the name of *Arnheim* and *Diemen;* though a different part from what afterwards received the name of Diemen's Land from Tasman, which was supposed to be the southern extremity, in latitude 43°. This is now found to be an island separated from New Holland by Bass's Straits. See *DIEMEN's Land.*

In 1619, Jan Van Edels gave his name to a southern part of New Holland. Another part, situated between 30 and 33° received the name of *Leuwen*. Peter Van Nuitz gave his name, in 1627, to a coast which communicates to Leuwen's Land towards the westward; and a part of the western coast, near the tropic of Capricorn, bore the name of *De Wit's*. In 1628, Peter Carpenter, a Dutchman, discovered the great gulf of Carpentaria, between 10 and 20° south. In 1687, Dampier, an Englishman, sailed from Timor, and coasted the western parts of New Holland. In 1699, he left England, with a design to explore this country, as the Dutch suppressed whatever discoveries had been made by them. He sailed along the western coast of it, from 28 to 15°. He saw the land of Eendraght and of De Wit. He then returned to Timor, from whence he went out again; examined the isles of Papua; coasted New Guinea; discovered the passage that bears his name; called a great island which forms this passage or strait on the east side, *New Britain;* and

New Holland.

failed back to Timor along New Guinea. This is the fame Dampier who, between 1683 and 1691, failed round the world by changing his ships. Notwithstanding the attempts of all these navigators, however, the eastern part of this vast tract was totally unknown till Captain Cook made his voyages; and by fully exploring that part of the coast, gave his country an undoubted title to the possession of it; which accordingly has since been taken possession of under the name of *New South Wales*.

1 Whether the name of *continent* belongs to New Holland.

Some have disputed whether the title of *island* can be properly applied to a country of such vast extent, or whether it ought not rather to be denominated a *continent*; while others have replied, that though the word island, and others similar to it, do indeed signify a tract of land surrounded by sea, yet in the usual acceptation it means only a land of moderate extent surrounded in this manner. Were it otherwise, we might call the whole world an island, as it is every where surrounded by the sea; and in fact, Dionysius Periegetes applies this term to it, with the addition of the word *immense*, to distinguish it from other islands. The best rule, according to Mr Stockdale, for determining when a country ought to lose the name of *island* and begin to be called a *continent*, is when it begins to lose the advantages of an insular situation. The first and principal of these, is the being capable of an union under one government, and thence deriving a security from all external attacks excepting those by sea; but in countries of great extent, this is not only difficult, but impossible. If we consider, therefore, New Holland as extending about a thousand miles every way, we shall find that its claim to be called a continent is undoubted; its length from east to west being about 2400 English miles, and 2300 from north to south.

2 Captain Cook's account of the country.

This coast was first explored by Captain Cook in the year 1770; but his stay was too short to examine the nature of the country with the accuracy which he would otherwise have done had he continued longer in it. In general, it was found rather barren than otherwise. Many brooks and springs were found along the eastern coast, but no river of any consequence. They found only two kinds of trees useful as timber, the pine, and another which produces a sort of gum. They found three kinds of palm trees; but few esculent plants, though there are abundance of such as might gratify the curiosity of the botanist. A great variety of birds were met with, which have since been particularly described; but the number of quadrupeds bears but a very small proportion to that of the other animals. The most remarkable insects seen at this time were the green ants (A), who build their nests upon trees in a very singular manner.

3 Settlement of a British colony in New Holland.

This country has now become an object of more consequence than formerly, by reason of the establishment of a British colony in it; where the criminals condemned to be transported are sent to pass their time of servitude. Before this plan was resolved on by government, another had been discussed, viz. that of employing these criminals in workhouses; and Judge Blackstone, with Mr Eden and Mr Howard, had considered of the best method of putting it in execution: but though this plan had been approved by parliament as early as 1779, some difficulties always occurred, which prevented its going forward; and at length, on the 6th of December 1786, orders were issued by his majesty in council for making a settlement on New Holland, establishing a court of judicature in the colony, and other regulations necessary on the occasion. The whole received the complete sanction of legislature in the beginning of the year 1787. The squadron appointed for putting the design in execution began to assemble at the Mother Bank, the place of rendezvous, in the Isle of Wight, on the 16th of March 1787. It consisted of the Sirius frigate Captain John Hunter, the Supply armed tender Lieutenant

(A) These little animals form their habitations, by bending down the leaves of trees, and glueing the ends of them together so as to form a purse. Though these leaves are as broad as a man's hand, they perform this feat by main strength, thousands of them being employed in holding down the leaves, while multitudes of others apply the glutinous matter. Captain Cook's people ascertained themselves that this was the case, by sometimes disturbing them at their work; in which case the leaf always sprung up with an elasticity, which they could not have supposed that such minute insects were capable of overcoming. For this curiosity, however, they smarted pretty severely; for thousands of these little enemies instantly threw themselves upon the aggressors, and revenged themselves by their bites or stings for the interruption they had met with. These were little less painful at first than the sting of a bee; but the pain did not last above a minute. Another species of ants burrow themselves in the root of a plant which grows on the bark of trees like the misletoe, and which is commonly as big as a large turnip. When this is cut, it appears intersected with innumerable winding passages all filled with these animals; notwithstanding which, the vegetation of the plant suffers no injury. These do not give pain by their stings, but produce an intolerable itching by crawling about on the skin. They are about the size of the small red ant in this country. Another sort, which do not molest in any manner, resemble the white ants of the East Indies. They construct nests three or four times as big as a man's head on the branches of trees; the outsides being composed of some vegetable matter along with a glutinous substance. On breaking the outer crusts of these hives, innumerable cells appear swarming with inhabitants, in a great variety of winding directions, all communicating with each other, and with several other nests upon the same tree. They have also another house built on the ground, generally at the root of a tree; formed like an irregularly sided cone; sometimes more than six feet high, and nearly as much in diameter. The outside of these is well-tempered clay about two inches thick; and within are the cells, which have no opening outward. One of these is their summer and the other their winter dwelling, communicating with each other by a large avenue leading to the ground, and by a subterraneous passage. The ground structures are proof against wet, which those on the branches are not.

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nant H. L. Ball; three ſtore-ſhips, the Golden-grove, Fiſhburn, and Borrowdale, for carrying proviſions and ſtores for two years; and laſtly, ſix tranſports, the Scarborough and Lady Penrhyn from Portſmouth, the Friendſhip and Charlotte from Plymouth, and the Prince of Wales and Alexander from Woolwich. Theſe were to carry the convicts, with a detachment of marines in each proportioned to the nature of the ſervice; the largeſt where reſiſtance was moſt expected, viz. in thoſe which carried the greateſt number of male convicts. On the arrival of Governor Phillip at the ſtation, he hoiſted his flag on board the Sirius as commodore of the ſquadron; and the embarkation being completed, he gave the ſignal to weigh anchor on the 13th of May at day-break. The number of convicts was 778, of whom 558 were men. They touched at the iſland of Teneriffe on the 3d of June, without meeting with any bad accident. Here they ſtaid a week, in order to procure ſuch refreſhments as were neceſſary for preventing the diſorders moſtly to be dreaded in ſuch a long and perilous voyage. In this they ſucceeded to their wiſh; and were about to depart on the 9th of June, when it was diſcovered that one of the convicts had made his eſcape, having found means to cut away a boat and make off with it. He offered himſelf as a ſailor aboard a Dutch veſſel at that time in the harbour, but was refuſed; on which he attempted to conceal himſelf in a cove. In this he would probably have ſucceeded, had it not been for the boat, which he could not conceal; ſo that he was ſoon diſcovered and brought back to the ſhip, where, however, he obtained his pardon from the governor.

On the 10th of June the fleet ſet ſail from Santa Cruz in the iſland of Teneriffe, and on the 18th came in ſight of the Cape Verd iſlands, where they ſteered for St Jago: but the want of a favourable wind and other circumſtances prevented their getting in; ſo that as Governor Phillip did not chooſe to waſte time, they did not touch land till they came to Rio Janeiro on the coaſt of Braſil. It may ſeem ſurpriſing, that a voyage to the eaſtward, which of itſelf may be accounted of ſufficient length, ſhould thus be wilfully made ſo much longer, by ſailing twice acroſs the Atlantic. The calms, however, ſo frequent on the coaſt of Africa, ſeem of themſelves to be a ſufficient inducement for navigators to preſerve a weſterly courſe; and even the iſlands at which it is ſo neceſſary to touch, are not far diſtant from the American coaſt. The returning tracks of Captain Cook's three voyages are all within a little ſpace of the 45th degree of weſt longitude, which is even 10 degrees farther weſt than Cape St Roque; and that courſe appears to have been taken voluntarily, without any extraordinary inducement.

During the time of their ſtay at Santa Cruz the weather had been very moderate; the barometer about 30 inches, and the thermometer never above 72; as they approached the Cape Verd iſlands it roſe to 82, and did not exceed 82° 51′ all the way from thence to Rio Janeiro. Here they met with a very favourable reception, contrary to that which Captain Cook experienced on a ſimilar occaſion. Proviſions were ſo cheap, that though the allowance of meat was fixed by the governor at 20 ounces per day, the men were victualled completely at 3¼d each, including rice, vegetables, and every other neceſſary. Wine was not at this time to be had except at an advanced price: but rum was laid in, and ſuch ſeeds and plants procured as were thought moſt likely to flouriſh in New South Wales; particularly coffee, indigo, cotton, and the cochineal fig. An hundred ſacks of caſſada were likewiſe purchaſed as a ſubſtitute for bread, if it ſhould happen to be ſcarce. By the kindneſs of the viceroy alſo, ſome deficiencies in the military ſtores were made up from the royal arſenal, and every aſſiſtance given which the place could afford. They arrived here on the 5th of Auguſt 1787, and ſet ſail on the 4th of September, receiving as the laſt compliment from the governor a ſalute of 21 guns.

From Rio de Janeiro the fleet had a fine run to Table Bay, in the ſouthern extremity of Africa, which they accompliſhed in 39 days: where they took in the refreſhments meant to ſupply them during the remainder of the voyage. Here they arrived on the 13th of October; and having ſupplied themſelves with a great number of live ſtock, they ſet ſail on the 12th of November, but were long impeded by contrary winds from the ſouth-eaſt. On the 25th they were only 80 leagues diſtant from the Cape, when Governor Phillip left the Sirius and went aboard the Supply tender; in hopes, by leaving the convoy, to gain ſufficient time for examining the country round Botany Bay, that the moſt proper ſituation for the new colony might be choſen before the tranſports ſhould arrive. They now met with favourable winds, blowing generally in very ſtrong gales from the north-weſt, weſt, and ſouth-weſt. The wind ſhifted only once to the eaſt, but did not continue in that direction above a few hours. On the 3d of January 1788 the Supply came within ſight of New South Wales; but the winds then became variable, and a current, which at times ſet very ſtrongly to the ſouthward, impeded her courſe ſo much, that it was not till the 18th of the month that ſhe arrived at Botany Bay.

4 They arrive at New Holland.

5 Interview with the natives.

Governor Phillip no ſooner landed than he had an opportunity of converſing with the natives, who were aſſembled on ſhore. As it was the intention of this gentleman to conciliate if poſſible their friendſhip, he uſed every method at this firſt interview to inſpire them with a favourable idea of the Europeans. For this purpoſe be preſented them with beads and other trifling ornaments, which they ſeemed pleaſed to wear, though Captain Cook found them very indifferent about any kind of finery he could furniſh them with. They ſeemed, according to the account of that celebrated navigator, to be ſo attached to their own ornaments, that they made no account of any thing elſe. They received indeed ſuch things as were given them, but made no offer to return any thing in exchange; nor could they be made to comprehend that any thing of the kind was wanted. Many of the preſents which they had received were found afterwards thrown away in the woods.

6 Inconvenience of Botany Bay for a ſettlement.

Governor Phillip having parted with his new acquaintance in a friendly manner, next ſet about an examination of the country about Botany Bay, which had been ſtrongly recommended by Captain Cook as the moſt eligible place for a ſettlement. He found, however, that the bay itſelf was very inconvenient for ſhipping; being expoſed to the eaſterly winds, and ſo ſhallow that ſhips even of a moderate burden could not

New Holland. get far enough within land to be ſheltered from the fury of the ocean. Neither did the land about any part of this bay appear an eligible ſituation for a colony; being in ſome places entirely ſwampy, in others quite deſtitute of water. Point Sutherland ſeemed to afford the ſituation moſt free from objections, but the ſhips could not approach it; and even here the ground ſeemed to be univerſally damp and ſpongy: ſo that, on the whole, finding no place within the compaſs of the bay proper for the new ſettlement, they found themſelves obliged to remove ſomewhere elſe.

The reſt of the fleet arrived in two days after the Supply; and that no time might be loſt, Governor Phillip ordered the ground about Point Sutherland to be cleared, and preparations to be made for landing, while he went with ſeveral officers in three boats to examine Port Jackſon, which was only three leagues diſtant. Here they had the ſatisfaction to find one of the fineſt harbours in the world, where 1000 ſail of the line might ride in perfect ſafety. On examining the different coves, one was preferred which had a fine run of ſpring water, and where ſhips could anchor ſo cloſe to the ſhore, that at a very ſmall expence quays might be conſtructed for loading and unloading the largeſt veſſels. This was named by the governor *Sydney Cove*, in honour of Lord Sydney, and the country around it deſtined for the place of ſettlement. It is about half a mile long, and a quarter of a mile broad at the entrance. On the governor's return to Botany Bay, the reports made to him concerning the adjacent country were ſo exceedingly unfavourable, that orders were

7 A ſettlement formed at Port Jackſon. immediately given for the removal of the fleet to Port Jackſon. On the morning of the 25th, therefore, the governor ſailed from Botany Bay, and was ſoon followed by the whole fleet. In the mean time, they were ſurpriſed by the appearance of two other European veſſels, which had been firſt ſeen off Botany Bay

8 Viſited by two French ſhips. on the 24th. Theſe were found to be two French ſhips, named the *Aſtrolabe* and *Bouſſole*, which had left France on a voyage of diſcovery under the command of M. la Peyrouſe, in the year 1785. They had touched at the iſland of Santa Catharina on the coaſt of Braſil, and from thence gone by the extremity of South America into the Pacific ocean, where they had run along by the coaſts of Chili and California; after which they had viſited Eaſter Iſland, Nootka Sound, Cook's river, Kamtſchatka, Manilla, the iſles des Navigateurs, and the Sandwich and Friendly Iſles. They had alſo attempted to land on Norfolk Iſland, but found it impoſſible on account of the ſurf. During the whole voyage none were loſt by ſickneſs; but two boats crews had unfortunately periſhed in a ſurf on the north-weſt coaſt of America; and at Maſuna, one of the *iſles des Navigateurs*, M. L'Angle, captain of the Aſtrolabe, with 12 of his people, officers and men, were murdered by the ſavages. This was the more ſurpriſing, as there had been an uninterrupted friendſhip with them from the time the French touched at the iſland, till that unfortunate moment. M. L'Angle had gone aſhore with two long boats for the purpoſe of filling ſome water-caſks. His party amounted to forty men; and the natives, from whom the French had already received abundance of refreſhments, did not ſhow any ſigns of a hoſtile diſpoſition: But from whatever motive their reſentment was excited, the men had no ſooner begun to get out the boats, than the ſavages made a moſt furious and unexpected aſſault with ſtones. In this encounter M. L'Angle himſelf, with the people above mentioned, fell a ſacrifice to the treachery of theſe barbarians. The remainder of the party eſcaped with great difficulty; the ſhips having at that time paſſed a point of land which intercepted their view of the affray.

The convicts and others deſtined to remain in New South Wales being landed, no time was loſt in beginning to clear ground for an encampment, ſtore-houſes, &c. The work, however, went on but ſlowly, partly owing to the natural difficulties they had to encounter, and partly to the habitual indolence of the convicts, which indeed was naturally to be expected conſidering their former way of life. Nevertheleſs, by the end of the firſt week of February, the plan of an encampment was formed, and places were marked out for different purpoſes, ſo that the colony already began to aſſume ſome appearance of order and regularity. The materials and frame-work of a ſlight temporary habitation for the governor had been brought out from England ready formed, which were landed and put together with as much expedition as circumſtances would allow. Hoſpital tents were alſo erected; and the ſickneſs which ſoon took place ſhowed the propriety of ſo doing. In the paſſage from the Cape there had been but little ſickneſs, and few of the convicts had died; but a little time after they landed a dyſentery began to prevail, which proved fatal in ſeveral inſtances, and the ſcurvy began to rage with great violence, ſo that the hoſpital-tents were ſoon filled with patients. The diſorder proved the more virulent as freſh proviſions could but rarely be obtained; nor were eſculent vegetables often obtained in ſuch plenty as could produce any material alleviation of the complaint: the only remedy for the dyſentery was found to be a kind of red gum, produced in plenty by the trees growing upon this coaſt. The yellow gum has the ſame properties, though in an inferior degree.

In the beginning of February, a moſt violent ſtorm of thunder and lightning deſtroyed five of the ſheep which had a ſhed erected for them under a tree, which proved a prelude to other misfortunes among the cattle. The encampment, however, was carried on with great alacrity; the foundations of the ſtore-houſes were laid, and every thing began to wear a promiſing appearance. On the 7th of the month a regular form of government was eſtabliſhed in the colony, with all the ſolemnity which could poſſibly be given: the governor made a proper ſpeech to the convicts, reminding them of the ſituation in which they ſtood; and that now, if they continued their former practices, it was impoſſible they could hope for mercy if detected; neither could they expect to eſcape detection in ſo ſmall a ſociety. Offenders, therefore, he ſaid, would certainly be puniſhed with the utmoſt rigour; though ſuch as behaved themſelves in a proper manner, might always depend upon encouragement. He particularly noticed the illegal intercourſe betwixt the ſexes, as a practice which encouraged profligacy in every reſpect; for which reaſon he recommended marriage: and this exhortation ſeemed not to be altogether in vain, as 14 marriages were celebrated that very week in conſequence. 9 Regular form of government eſtabliſhed.

Heavy rains took place during the remainder of this month,

month, which ſhowed the neceſſity of going on with the work as ſoon as poſſible. The want of carpenters, however, prevented this from being done ſo expeditiouſly as could have been wiſhed. Only 16 of theſe could be hired from all the ſhips; and no more than 12 of the convicts were of this profeſſion, of whom ſeveral were ſick; ſo that the party were by far too few for the work they had to perform. An hundred convicts were added as labourers; but with every effort it was found impoſſible to complete either the barracks or the huts for the officers ſo ſoon as could be wiſhed.

10 Norfolk Iſland ſettled.

On the 14th of February a ſmall party was ſent out to ſettle on Norfolk Iſland, who have ſince eſtabliſhed a colony there which promiſes to be of conſiderable utility †. It was ſoon found, however, abſolutely neceſſary to make examples of ſome of the convicts at Port Jackſon. Towards the end of February it was found neceſſary to convene a criminal court, in which ſix of the convicts received ſentence of death. One who was the head of the gang was executed the ſame day: one of the reſt was pardoned; the other four were reprieved, and afterwards exiled to a ſmall iſland within the bay, where they were kept on bread and water. They had frequently robbed both the ſtores and other convicts. The fellow who was executed, and two others, had been detected in ſtealing the very day on which they received a week's proviſion; and at the ſame time that their allowance was the ſame as that of the ſoldiers, ſpirituous liquors only excepted.

† See *Norfolk Iſland.*

11 Broken Bay examined.

In the beginning of March the governor went out with a ſmall party to examine Broken Bay, lying about eight miles to the northward of Port Jackſon. This was found very extenſive, with many openings. One of the latter ended in ſeveral ſmall branches, and a large lagoon, which they could not at that time examine. Moſt of the land about the upper part of this branch was low and full of ſwamps, with great numbers of pelicans, and other aquatic birds. Among the reſt they met with an uncommon bird, called at that time the *Hooded Gull*, but afterwards found to be the ſpecies named by Mr Latham the *Caſpian Tern.*

From this north-weſt branch they proceeded acroſs the bay to the ſouth-weſt branch, which is alſo very extenſive, with a ſecond opening to the weſtward capable of affording ſhelter to almoſt any number of ſhips, with depth of water for veſſels of almoſt any burden. The land was found much higher here than at Port Jackſon, more rocky, and equally covered with timber. Large trees were ſeen growing even on the ſummits of the mountains, which appeared totally inacceſſible to the human ſpecies. Round the headland which forms the ſouthern entrance into the bay is a third branch, which Governor Phillip thought the fineſt piece of water he had ever ſeen; which for that reaſon he honoured with the name of *Pitt-water.* This branch, as well as the former, is ſufficient to contain all the navy of Great Britain; but the latter has a bar at the entrance of only 18 feet at low water. Within are from 7 to 15 fathoms. The land here is more level than on the ſouth-weſt branch, and ſome ſituations are proper for cultivation. The governor determined to have returned by land, in order to explore the country betwixt Port Jackſon and Broken Bay, but the continual rains prevented him.

On the 10th of March the French ſhips departed, little intercourſe having paſſed between them and the Engliſh during the time of their ſtay. While the former remained in Botany Bay, Father la Receveur, who had come out in the Aſtrolabe as a naturaliſt, died of the wounds he had received in the battle with the inhabitants of Maſuna. A kind of monument was erected to his memory, with the following inſcription:

12 Death of La Receveur.

Hic jacet LA RECEVEUR
E. F. F. minimis Galliæ ſacerdos,
Phyſicus in circumnavigatione
Mundi
Duce DE LA PEYROUSE,
Ob. 17. Feb. 1788.

This monument, however, was ſoon after deſtroyed by the natives; on which Governor Philip cauſed the inſcription to be engraved on copper and nailed to a neighbouring tree. M. de la Peyrouſe had paid a ſimilar tribute to the memory of Captain Clerke at Kamtſchatka.

13 Excurſions into the interior part of the country.

On the 15th of April, the governor, attended by ſeveral officers and a ſmall party of marines, ſet out on an expedition into the interior parts of the country. Their firſt landing was at the head of a ſmall cove named *Shell-cove*, near the entrance of the harbour on the north ſide. Proceeding in this direction, they arrived with great labour at a large lake, ſurrounded on all ſides with bog and marſhy ground to a conſiderable extent, and in which they frequently plunged up to the waiſt. Here they obſerved that bird ſo rare in other parts of the world, viz. a black ſwan. On being fired at, it roſe, and ſhewed that its wings were edged with white, the bill being tinged red. They ſpent three days in a very laborious manner in paſſing the marſhes and ſwamps which lie in the neighbourhood of the harbour: and here they had an opportunity of obſerving, that all the ſmall ſtreams which deſcend into Port Jackſon proceed from ſwamps, occaſioned by the ſtagnation of the water in the low grounds as it riſes from the ſprings. On leaving theſe low grounds, they found them ſucceeded by a rocky and barren country; the hills covered with various flowering ſhrubs, though frequently inacceſſible by reaſon of various natural obſtacles. At about 15 miles diſtance from the ſea, the governor had a fine view of the internal parts of the country, which were mountainous. To the moſt northerly chain of theſe he gave the name of *Carmarthen*, and to the moſt ſoutherly that of *Lanſdown Hills;* and to one which lay between theſe he gave the name of *Richmond Hill.* It was conjectured, that a large river muſt riſe from theſe mountains; but there was now a neceſſity for returning. On the 22d, however, another expedition was undertaken. Governor Phillip with his party landed near the head of the harbour. Here they found a good country; but in a ſhort time arrived at a cloſe thicket through which they found it impoſſible to make their way, ſo that they were obliged to return. Next day, by keeping cloſe to the banks of a ſmall creek, they made a ſhift to paſs that obſtacle, and continued their courſe for three days to the weſtward. The country was now extremely fine, either entirely level or riſing in ſmall hills; the ſoil excellent, but ſtony in a few places. The trees grew at the diſtance of from 20 to 40 feet from each other, in general totally deſtitute of underwood, which was confined to the barren and ſtony ſpots.

ſpots. On the 5th day they ſaw for the firſt time in this ſecond expedition Carmarthen and Lanſdown hills; but the country all round was ſo beautiful, that Governor Phillip gave it the name of *Belle Vue*. They were ſtill apparently 30 miles from the mountains which they had intended to reach; but not having been able to carry more than ſix days proviſions along with them, they found it neceſſary to return; and even with this ſmall ſtock the officers as well as men were obliged to carry heavy loads. During all this time they had not proceeded farther in a direct line than 30 miles, ſo great were the obſtructions they had met with from deep ravines, &c. Their return, however, was effected with much greater eaſe, having cleared a track, and marked trees all the way as they went along to direct them in their journey back. The country explored at this time appeared ſo fine, that Governor Phillip determined to form a ſettlement there as ſoon as a ſufficient number could be ſpared from thoſe works which were immediately neceſſary. On his return he had the mortification to find, that five ewes and a lamb had been killed very near the camp, and in the middle of the day. This miſchief was ſuppoſed to have been done by ſome dogs belonging to the natives.

All this time the ſcurvy had continued to rage with great violence: ſo that by the beginning of May near 200 people were incapable of work. For this reaſon, and on account of the great difficulty of clearing the ground, no more than eight or ten acres of wheat and barley had been ſown, beſides what private individuals had ſown for themſelves; and it was even feared that this ſmall crop would ſuffer from the depredations of ants and field mice. To procure as much relief as poſſible therefore in the preſent exigence, the Supply was ſent in the beginning of May to Lord Howe Iſland in hopes of procuring ſome turtle and other proviſions; but unfortunately the veſſel returned without any tur-

14 Murders committed by the natives.

tle, having met with ſqually weather, and being obliged to cut away her beſt bower anchor. The natives now began to ſhow an hoſtile diſpoſition, which they had not hitherto done. One of the convicts, who had wandered away from the reſt in queſt of vegetables, returned with a very dangerous wound in the back; giving information alſo, that another who had gone out for the ſame purpoſe had been carried off in his ſight by the natives, after being wounded in the head. A ſhirt and hat were afterwards found in ſome of the huts of the natives, but no intelligence of the man could be gained. This was followed by other misfortunes of the ſame nature. On the 30th of the month, two men who had been employed in cutting ruſhes for thatch at ſome diſtance from the camp were found dead. One of them had four ſpears in his body, one of which had pierced quite through it; but the other had no marks of violence upon him. In this caſe, however, it was proved, that thoſe who ſuffered had been the aggreſſors; as they had been ſeen with one of the canoes of the natives which they had taken from one of the fiſhing places. All poſſible inquiry was made after the natives who had been guilty of the murder, but to no purpoſe. In the courſe of this inquiry, it was found that one of the natives had been murdered, and ſeveral wounded, previous to the attack upon the ruſh-cutters. The governor promiſed liberty to any convict who ſhould diſcover the aggreſſors; but no information was procured, though it is probable that it may prevent accidents of that kind for the future. About this time the two bulls and four cows belonging to government and to the governor, having been left for ſome time by the man who had the charge of them, ſtrayed into the woods and could not be recovered, though they were afterwards traced to ſome diſtance.

The 4th of June being his majeſty's birth-day, was celebrated with as much feſtivity as circumſtances would allow; and on this occaſion it was firſt made public that the governor had given the name of *Cumberland County* to this part of the territory. The appointed boundaries were Carmarthen and Lanſdown hills on the weſt, the northern parts of Broken Bay on the north, and the ſouthern parts of Botany Bay on the ſouth; thus including theſe three principal bays, with Sydney Cove nearly in the centre.

15 A convict executed.

The misfortunes which attended thoſe convicts who ſtrayed to too great a diſtance from the ſettlement, were not ſufficient to prevent ſome of them from rambling into the woods, in hopes of ſubſiſting themſelves there and regaining their liberty. One of theſe, who had been guilty of a robbery, fled into the woods on the 5th of June, but was obliged to return half-ſtarved on the 24th. He had found it impoſſible to ſubſiſt in the woods, and had met with very little relief from the natives. One of them gave him a fiſh, but made ſigns for him to go away. According to his account, they themſelves were in a very miſerable ſituation; and he pretended to have ſeen four of them apparently dying of hunger, who made ſigns to him for ſomething to eat. He pretended alſo to have fallen in with a party who would have burnt him, and that he made his eſcape from them with difficulty. He ſaid alſo, that he had ſeen the remains of a human body lying on a fire; and endeavoured to inculcate the idea of theſe ſavages eating human fleſh when other proviſions were ſcarce. This poor wretch was tried and executed for the theft he had committed before his departure, along with another criminal.

16 Regular plan of a town laid.

By this time the colony was ſo far advanced, that the plan of a regular town had been marked out. The principal ſtreet, when finiſhed, is to be 200 feet wide, terminated by the governor's houſe, the main guard, and criminal court. The plans of other ſtreets are likewiſe marked out; and it is the governor's intention, that when houſes are built here, the grants of land ſhall be made with ſuch clauſes as will prevent the building of more than one houſe on one allotment, which is to conſiſt of 60 feet in front and 150 in depth. Thus a kind of uniformity will be preſerved in the building, narrow ſtreets prevented, and many inconveniences avoided, which a rapid increaſe of inhabitants might otherwiſe occaſion. It has likewiſe been an object of the governor's attention to place the public buildings in ſuch ſituations as will be eligible at all times, and particularly to give the ſtore-houſes and hoſpital ſufficient ſpace for future enlargement, ſhould it be found neceſſary. The firſt huts erected in this place were compoſed only of the ſoft wood of the cabbage palm, in order to give immediate ſhelter, and which had the further inconvenience of being uſed quite green. The huts of the convicts were conſtructed only of upright poſts wattled with ſlight twigs, and plaſtered up with clay. Buildings of ſtone might eaſily have been

New Holland. been raiſed, had there been any means of procuring lime for mortar. There were three kinds of ſtone met with about Sydney Cove, one equal in goodneſs to Portland ſtone, an indifferent kind of ſandſtone or freeſtone, and a ſort which ſeems to contain iron; but neither chalk nor any ſpecies of limeſtone has yet been diſcovered. Lime was indeed procured from oyſter-ſhells collected in the neighbouring coves to conſtruct a ſmall houſe for the governor; but it cannot be expected that a ſufficient quantity can thus be procured for many or very extenſive buildings. Good clay for bricks has been found near Sydney Cove, and very good bricks have been made of it; the wood alſo, notwithſtanding the many reports to the contrary, is found abundantly fit for various purpoſes after being thoroughly ſeaſoned. Such ſpecimens as have been ſent to England were fine-grained and free of knots, but heavy.

On the point of land that forms the weſt ſide of the Cove a ſmall obſervatory has been erected, the longitude of which has been aſcertained to be 159° 19′ 30″ eaſt from Greenwich, and the latitude 32° 52′ 30″ ſouth. Inſtead of thatch they now make uſe of ſhingles made from a certain tree, which has the appearance of a fir, but produces wood like Engliſh oak.

17 Different accounts of the colony.

With regard to the ſtate of this colony there have been various and diſcordant accounts. Some of theſe have repreſented the country in ſuch a light, that it would ſeem impoſſible to ſubſiſt on it; and it has been ſaid, that the people who have had the miſfortune to go there already were in the utmoſt danger of ſtarving before any aſſiſtance could be ſent from Britain. Theſe reports, however, appear not to be well founded. Difficulties muſt undoubtedly be felt at the firſt ſettlement of every uninhabited country; and we are not to expect that a colony, moſt of whom are wretches exiled for their crimes from their own country, can thrive in an extraordinary manner for ſome time. It appears, indeed, that ſo far from the tranſportation to this place having had any good effect in reforming them, the governor has been obliged to execute the utmoſt rigour of the law by hanging ſeveral of them. A good number of others have unaccountably diſappeared, and are ſuppoſed to have been murdered by the natives, or periſhed with hunger in the woods; ſo that, unleſs the numbers be recruited by more reſpectable inhabitants, it is not likely that much can be expected from the Port Jackſon ſettlement for a long time to come. Of this, however, there ſeems to be little doubt: the general ſpirit of emigration which prevails through moſt, indeed we may ſay all the countries of Europe, will undoubtedly ſoon ſupply a ſufficient number; and even ſome of the Americans, notwithſtanding the extent and fertility of their own country, and the liberty they enjoy in it, are ſaid to be willing to exchange theſe bleſſings for the precarious hopes of what may be obtained in New Holland among Britiſh convicts and ſlaves. This rambling diſpoſition may perhaps be accounted for from an obſervation which has been made, viz. that "it may admit of a doubt whether many of the accommodations of a civilized life be not more than counterbalanced by the artificial wants to which they give birth. That theſe accommodations do not give a ſatisfaction equivalent to the trouble with which they are procured, is certain; and it is no wonder, then, to find numbers of people in every country who are willing to exchange them for independent eaſe and tranquillity, which belong, comparatively ſpeaking, to few individuals in thoſe countries which are called civilized."

18 General account of the country.

With regard to the geography of this extenſive country, which may perhaps be reckoned a fifth general diviſion of the world, Captains Cook and Furneaux ſo fully explored its coaſts, that ſucceeding navigators have added nothing to their labours. The only part which ſtill remains unknown is that between the latitudes of 37° 58′ and 39° ſouth; and as none of the fleet which lately ſailed from Britain could be ſuppoſed to undertake any voyage of diſcovery, it is unknown whether or not a ſtrait interſects the continent in this place or not. Captain Tench, however, informs us, on the authority of a naval friend, "that when the fleet was off this part of the coaſt, a ſtrong ſet-off ſhore was plainly felt."

A vaſt chain of lofty mountains runs nearly in a north and ſouth direction farther than the eye can trace, about 60 miles inland. The general face of the country is pleaſing, diverſified with gentle riſings and ſmall winding valleys, covered for the moſt part with large ſpreading trees, affording a ſucceſſion of leaves in all ſeaſons. A variety of flowering ſhrubs, almoſt all entirely new to an European, and of exquiſite fragrance, abound in thoſe places which are free from trees; and among theſe, a tall ſhrub, bearing an elegant flower which ſmells like Engliſh may, is peculiarly delightful, and perfumes the air to a great diſtance. There are but few trees; and, as Captain Tench and others relate, of ſo bad a grain, that they can ſcarcely be uſed for any purpoſe: This, however, Mr Stockdale aſcribes to their being uſed in an unſeaſoned ſtate, as has been already mentioned. In return for theſe bad qualities, however, the trees yield vaſt quantities of the gum already mentioned as a cure for the dyſentery. It is of an acrid quality, and therefore requires to be given along with opiates. The tree which yields it is of very conſiderable ſize, and grows to a great height before it puts out any branches. The gum itſelf is uſually compared to *ſanguis draconis*, but differs from it in being perfectly ſoluble in water, which the ſanguis draconis is not. It may be extracted from the wood by tapping, or taken out of the veins when dry. The leaves are narrow, and not unlike thoſe of a willow; the wood fine-grained and heavy, but warps to ſuch a degree, when not properly ſeaſoned, as ſoon to become entirely uſeleſs. 19 Red and yellow gums.

The yellow gum is properly a reſin, being entirely inſoluble in water. It greatly reſembles gamboge, but has not the property of ſtaining. It is produced by a low ſmall plant with long graſſy leaves; but the fructification ſhoots out in a ſurpriſing manner from the centre of the leaves on a ſingle ſtraight ſtem to the height of 12 or 14 feet. This ſtem is ſtrong and light, and is uſed by the natives for making their ſpears. The reſin is generally dug up from the ſoil under the tree, not collected from it, and may perhaps be the ſame which Taſman calls *gum lac of the ground*. It has been tried by Dr Blane phyſician to St Thomas's hoſpital, who found it very efficacious in the cure of old fluxes, and that in many and obſtinate caſes. Many of the New Holland plants have been already imported

imported into Britain, and are now flouriſhing in perfection at the nurſery garden of Mr Lee of Hammerſmith.

The ſoil immediately around Sydney Cove is ſandy, with here and there a ſtratum of clay; but hitherto the produce has not been remarkable. The principal difficulty hitherto experienced in clearing the ground ariſes from the ſize of the trees, which is ſaid to be ſo enormous, that 12 men have been employed for five days in grubbing up one. Captain Cook ſpeaks of ſome fine meadows about Botany Bay; but none of theſe have been ſeen by the preſent ſettlers, and Governor Phillip ſuppoſes them to have been ſwamps ſeen at a diſtance. Graſs grows in almoſt every place, but in the ſwamps with the greateſt vigour and luxuriancy, though not of the fineſt quality. It is found to agree better with cows and horſes than ſheep. A few wild fruits are ſometimes procured; among which is a kind of ſmall purple apple mentioned by Captain Cook; and a fruit which has the appearance of a grape, but taſting like a green gooſeberry, and exceſſively ſour.

20
Scarcity of freſh water.

From the firſt diſcovery of this continent, the extreme ſcarcity of freſh water has been mentioned by every navigator. None have been fortunate enough to enter the mouth of any navigable river ſuch as might be expected in a country of ſuch extent. The ſettlers about Port Jackſon found enough for the common purpoſes of life; but Captain Tench informs us, that when he left the country, towards the end of 1788, there had been no diſcovery of a ſtream large enough to turn a mill. Since that time, however, Governor Phillip has been more ſucceſsful; as we are informed by a letter of his to Lord Sydney, of date Feb. 13. 1790: In this letter he relates, that ſoon after the ſhips failed in November 1788, he again made an excurſion to Botany Bay, where he ſtaid five days; but the reſearches he made there tended only to confirm him in the opinion he already entertained that the country round it was by no means an eligible ſituation for a colony. After having viſited Broken Bay ſeveral times with boats, a river was found, which has ſince been traced, and all thoſe branches explored which afforded any depth of water. This river has obtained the name of *Hawkeſbury*, is from 300 to 800 feet wide, and ſeems navigable for the largeſt merchant ſhips as far up as Richmond hill, at which it becomes very ſhallow, and divides into two branches; on which account the governor calls Richmond hill the head of the river. As after very heavy rains, however, the water ſometimes ariſes 30 feet above its level, it would not be ſafe for ſhips to go up ſo far; but 15 or 20 miles below it they would lie in freſh water, and be perfectly ſafe.

21
Rivers diſcovered by Captain Phillip.

The country about Broken Bay is at firſt high and rocky, but as we proceed up the river it becomes more level, the banks being covered with timber, and the ſoil a light rich mould, ſuppoſed to be very capable of cultivation. The other branches of this river are ſhallow, but probably run many miles up into the country. Great numbers of black ſwans and wild ducks were ſeen on theſe rivers, and the natives had ſeveral decoys for catching quails.

Richmond hill, near which a fall prevented the boats from proceeding farther up, is the moſt ſoutherly of a large range of hills which run to the northward, and probably join the mountains nearly parallel to the coaſt from 50 to 60 miles inland. The ſoil of this hill is good, and it lies well for cultivation. There is a very extenſive proſpect from the top, the whole country around ſeeming a level covered with timber. There is a flat of ſix or ſeven miles between Richmond hill and a break in the mountains which ſeparates Lanſdown and Carmarthen hills; in which flat the governor ſuppoſes that the Hawkeſbury continues its courſe; though the river could not be ſeen on account of the timber with which the ground is everywhere covered where the ſoil is good. Six miles to the ſouthward of Port Jackſon is a ſmall river; and 20 to the weſtward is one more conſiderable, which probably empties itſelf into the Hawkeſbury. As far as this river was at that time explored, the breadth was computed at from 300 to 400 feet. It was named the *Nepean*, and, like the Hawkeſbury, ſometimes riſes 30 feet above its level. A party who croſſed the river attempted to reach the mountains, but found it impoſſible, probably for want of proviſions. After the firſt day's journey they met with ſuch a ſucceſſion of deep ravines, the ſides of which were frequently ſo inacceſſible, that in five days they could not proceed farther than 15 miles. At the time they turned back, they ſuppoſed themſelves to be 12 miles from the foot of the mountains. With regard to the ſtate of the colony, it appears from this letter to be as flouriſhing as could in any reaſonable manner be expected. Another has been formed at a place called Roſehill, at the head of the harbour of Sydney Cove. At this place is a creek, which at half flood has water for large boats to go three miles up; and one mile higher the water is freſh and the ſoil good. Some ground having been cleared and cultivated, the governor in the above letter writes, that 27 acres were ſown with corn, and that in December the crop was got in: That the corn was exceedingly good; about 200 buſhels of wheat and 60 of barley, with a ſmall quantity of flax, Indian corn, and oats; all which is preſerved for ſeed: That if ſettlers are ſent out, and the convicts divided amongſt them, this ſettlement will very ſhortly maintain itſelf; but without which this country cannot be cultivated to any advantage. "At preſent (continues the governor) I have only one perſon, who has about 100 convicts under his direction, who is employed in cultivating the ground for the public benefit, and he has returned the quantity of corn above mentioned into the public ſtore: the officers have raiſed ſufficient to ſupport the little ſtock they have: ſome ground I have had in cultivation will return about 40 buſhels of wheat into ſtore; ſo that the produce of the labour of the convicts employed in cultivation has been very ſhort of what might have been expected, and which I take the liberty of pointing out to your lordſhip in this place; to ſhow as fully as poſſible the ſtate of this colony, and the neceſſity of the convicts being employed by thoſe who have an intereſt in their labour." The country for 20 miles to the weſtward is very capable of cultivation; though the labour of cutting down the trees is very great. At Sydney Cove the ſtores had been infeſted by a ſwarm of rats which deſtroyed no leſs than 12,000 lb. weight of flour and rice. The gardens alſo had ſuffered very conſiderably; ſo that, having met with ſuch a conſiderable loſs of

New Holland. of pﬁoviſion, and a ſufficient ſupply not being procured from the Cape, Governor Phillip thought proper to ſend a further detachment to Norfolk Iſland, where the fertility of the ſoil afforded great hopes of their being able in a ſhort time to ſubſiſt themſelves independent of any aſſiſtance from the ſtores.

22 Government of the colony. With regard to the civil eſtabliſhment in this colony, Governor Phillip's juriſdiction extends from 43° 49′ to 10° 37′ ſouth, being the northern and ſouthern extremities of the continent. It commences again in 135° E. Long. from Greenwich; and proceeding in an eaſterly direction, includes all the iſlands within the above mentioned latitudes in the Pacific ocean; by which partition it is ſuppoſed that every ſource of litigation will be cut off, as all theſe are indiſputably the diſcovery of the Britiſh navigators,

The powers of the governor are abſolutely unlimited, no mention being made of a council to aſſiſt him in any thing; and as no ſtated time is appointed for aſſembling the courts ſimilar to the aſſizes and gaol deliveries in England, the duration of impriſonment is altogether in his hands. He is likewiſe inveſted with a power of ſummoning general courts martial; but the inſertion in the marine mutiny act, of a ſmaller number of officers than 13 being able to compoſe ſuch a tribunal, has been neglected; ſo that a military court, ſhould detachments be made from head quarters, or ſickneſs prevail, may not always be found practicable to be obtained, unleſs the number of officers in the ſettlement at preſent be increaſed. The governor is allowed to grant pardons in all caſes, treaſon and wilful murder excepted; and even in theſe he has authority to ſtay the execution of the law until the king's pleaſure ſhall be ſignified. In caſe of the governor's death, the lieutenant governor takes his place; and on his deceaſe, the authority is lodged in the hands of the ſenior officer.

It was not long after the convicts were landed that there appeared a neceſſity for aſſembling a criminal court; and it was accordingly convened by warrant from the governor. The members were the judge advocate, who preſided, three naval, and three military officers. The number of members is limited by act of parliament to ſeven; who are expreſly ordered to be officers either of his majeſty's ſea or land forces. The court being met, completely arrayed and armed as at a military tribunal, the judge advocate proceeds to adminiſter the uſual oaths taken by jurymen in England to each member; one of whom afterwards ſwears him in a like manner. This ceremony being over, the crime is laid to the priſoner's charge, and the queſtion "guilty or not guilty" put to him. No law officer being appointed on the part of the crown, the party at whoſe ſuit he is tried is left to proſecute the priſoner entirely by himſelf. All the witneſſes are examined on oath; and the deciſion muſt be given according to the laws of England, or "as nearly as may be, allowing for the circumſtances and ſituation of the ſettlement," by a majority of votes, beginning with the youngeſt member, and ending with the preſident of the court. No verdict, however, can be given in caſes of a capital nature, unleſs at leaſt five of the ſeven members concur therein. The evidence on both ſides being finiſhed, and the priſoner's defence heard, the court is cleared, and, on the judgment being ſettled, is thrown open again, and ſentence pronounced. During the time of ſitting, the place in which it is aſſembled is directed to be ſurrounded by a guard under arms, and admiſſion granted to every one who chooſes to enter it. Of late, however, ſays Captain Trench, our coloniſts are ſuppoſed to be in ſuch a train of ſubordination, as to make the preſence of ſo large a military force unneceſſary; and two centinels in addition to the provoſt marſhal are conſidered as ſufficient.

23 Trials of convicts, &c. The firſt trials which came before this court were thoſe of three convicts, one of whom was convicted of having ſtruck a marine with a cooper's adze, and behaving otherwiſe in a moſt ſcandalous and riotous manner. For this he was condemned to receive 150 laſhes, being a ſmaller puniſhment than a ſoldier would have ſuffered in a ſimilar caſe. A ſecond, for having committed a petty theft, was ſent to a ſmall barren iſland, and kept there on bread and water only for a week. The third was ſentenced to receive 50 laſhes; but being recommended by the court to the governor, had his ſentence remitted. The ſame lenity, however, could not be obſerved in all caſes. One fellow, who had been condemned to be hanged, was pardoned while the rope was about his neck, on condition that he would become the common executioner ever after. He accepted the horrid office, but not without a *pauſe*. Some examples of ſeverity were undoubtedly neceſſary; and among theſe it is impoſſible to avoid feeling ſome regret for the fate of one who ſuffered death for ſtealing a piece of ſoap of eight pence value: but by a letter of Governor Phillip, we are informed that the convicts in general had begun to behave much better; more ſo indeed than ever he expected; and at this time one woman had ſuffered for a robbery; five children had died, and 28 had been born. The whole amount of the deaths 77, of the births 87.

The number of convicts already ſent to New South Wales amounts to 2000 and upwards—above 1800 are ſince embarked for that ſettlement. The annual expence of the civil and military eſtabliſhments at that place is nearly 10,000l. This was previous to 1792.

Beſides the criminal court, there is an inferior one, compoſed of the judge advocate, and one or more juſtices of the peace, for the trial of ſmall miſdemeanors. This court is likewiſe empowered to decide all lawſuits; and its verdict is final, except where the ſum exceeds 300l. in which caſe an appeal can be made to to England from its decree. In caſe of neceſſity, an admiralty court, of which the lieutenant governor is judge, may alſo be ſummoned for the trial of offences committed on the high ſeas.

24 Animals found in New Holland. The quadrupeds on the continent of New Holland hitherto diſcovered, are principally of the opoſſum kind, of which the moſt remarkable is the kangaroo. There is alſo a ſpecies of dogs very different from thoſe known in Europe. They are extremely fierce, and never can be brought to the ſame degree of familiarity with thoſe we are acquainted with. Some of them have been brought to England, but ſtill retain their uſual ferocity. There are a great many beautiful birds of various kinds; among which the principal are the black ſwans already mentioned, and the oſtrich or caſſowary; which laſt arrives frequently at the height of ſeven feet or more. Several kinds of ſerpents, large ſpiders,

New Holland. fpiders, and fcolopendras, have alfo been met with. There are likewife many curious fifhes; though the finny tribe feem not to be fo plentiful on the coaft as to give any confiderable affiftance in the way of provifions for the colony. Some very large fharks have been feen in Port Jackfon, and two fmaller fpecies, one named the Port Jackfon fhark, the other Watts's fhark. The latter, notwithftanding its diminutive fize, the mouth fcarce exceeding an inch in breadth, is exceffively voracious. One of them having been taken and flung down upon the deck, lay there quiet for *two hours;* after which Mr Watts's dog happening to pafs by, the fifh fprung upon it with all the ferocity imaginable, and feized it by the leg in fuch a manner that the animal could not difengage himfelf without affiftance.

25 Climate.

The climate of this continent appears not to be difagreeable, notwithftanding the violent complaints which fome have made about it. The heat has never been exceffive in fummer, nor is the cold intolerable in winter. Storms of thunder and lightning are frequent; but thefe are common to all warm countries; and it has been fuppofed (though upon what foundation does not well appear) that were the country cleared of wood, and inhabited, thefe would in a great meafure ceafe. A fhock of an earthquake has likewife been felt; but thefe natural calamities are incident to fome of the fineft countries in the world. It is not known whether or not there are any volcanoes.

26 Account of the inhabitants.

The inhabitants of New Holland are by all accounts reprefented as the moft miferable and favage race of mortals perhaps exifting on the face of the earth. They go entirely naked; and though pleafed at firft with fome ornaments which were given them, they foon threw them away as ufelefs. It does not appear, however, that they are infenfible of the benefits of clothing, or of fome of the conveniences which their new neighbours are in poffeffion of. Some of them, whom the colonifts partly clothed, feemed to be pleafed with the comfortable warmth they derived from it; and they all exprefs a great defire for the iron tools which they fee their neighbours make ufe of. Their colour, in the opinion of Captain Cook, is rather a deep chocolate than a full black; but the filth with which their fkins are covered, prevents the true colour of them from appearing. At fome of their interviews with the colonifts, feveral droll inftances happened of their miftaking the negroes among the colonifts for their own countrymen. Notwithftanding their difregard for European finery, they are fond of adorning, or rather deforming, their bodies with fcars; fo that fome of them cut the moft hideous figure that can be imagined. The fcars themfelves have an uncommon appearance. Sometimes the fkin is raifed feveral inches from the flefh, and appears as if filled with wind; and all thefe feem to be reckoned marks of honour among them. Some of them perforate the cartilage of the nofe, and thruft a large bone through it, an hideous kind of ornament, humoroufly called by the failors their *fprit-fail-yard.* Their hair is generally fo much clotted with the red gum already mentioned, that they refemble a mop. They alfo paint themfelves with various colours like moft other favages; they will alfo fometimes ornament themfelves with beads and fhells, but make no ufe of the beautiful feathers procurable from the birds of the country. Moft of the men want one of the fore-teeth in the upper jaw; a circumftance mentioned by Dampier and other navigators; and this alfo appears to be a badge of honour among them. It is very common among the women to cut off the two lower joints of the little finger; which, confidering the clumfinefs of the amputating inftruments they poffefs, muft certainly be a very painful operation. This was at firft fuppofed to be peculiar to the married women, or thofe who had born children; but fome of the oldeft women were found without this diftinction, while it was obferved in others who were very young.

The New Hollanders appear extremely deficient in the ufeful arts. Of the cultivation of the ground they have no notion; nor can they even be prevailed upon to eat bread or dreffed meat. Hence they depend entirely for fubfiftence on the fruits and roots they can gather, with the fifh they catch. Governor Phillip alfo mentions their frequent fetting fire to the grafs, in order to drive out the opoffums and other animals from their retreats; and we have already taken notice of their ufing decoys for quails. As all thefe refources, however, muft be at beft precarious, it is no wonder that they are frequently diftreffed for provifions. Thus, in the fummer-time, they would eat neither the fhark nor fting-ray; but in winter any thing was acceptable. A young whale being driven afhore, was quickly cut in pieces and carried off. They broiled it only long enough to fcorch the outfide, and in this raw ftate they eat all their fifh. They broil alfo the fern root and another whofe fpecies is unknown. Among the fruits ufed by them is a kind of wild fig; and they eat alfo the kernels of a fruit refembling the pine apple. The principal part of their fubfiftence, however, is fifh; and when thefe happened to be fcarce, they were wont to watch the opportunity when the colonifts hauled the feine, and often feized the whole, though a part had formerly been offered or given them. They fometimes ftrike the fifh from the canoes with their fpears, fometimes catch them with hooks, and alfo make ufe of nets, contrary to the affertion of Dr Hawkefworth, who fays that none of thefe are to be met with among them. Their nets are generally made of the fibres of the flax plant, with very little preparation, and are ftrong and heavy; the lines of which they are compofed twifted like whip-cord. Some of them, however, appear to be made of the fur of an animal, and others of cotton. The mefhes of their nets are made of very large loops artificially inferted into each other, but without any knots. Their hooks are made of the infide of a fhell very much refembling mother-of-pearl. The canoes in which they fifh are nothing more than large pieces of bark tied up at both ends with vines; and confidering the flight texture of thefe veffels, we cannot but admire the dexterity with which they are managed, and the boldnefs with which they venture in them out to fea. They generally carry fire along with them in thefe canoes, to drefs their fifh when caught. When fifhing with the hook, if the fifh appears too ftrong to be drawn afhore by the line, the canoe is paddled to the fhore; and while one man gently draws the fifh along, another ftands ready to ftrike it with a fpear, in which he generally fucceeds. There is no good reafon for fuppofing them to be cannibals, and they never eat animal fubftances but raw or next to it. Some

New Holland.

Some of their vegetables are poiſonous when raw, but deprived of this property when boiled. A convict unhappily experienced this by eating them in an unprepared ſtate; in conſequence of which he died in 24 hours. The diſlike of the New Hollanders to the European proviſions has already been mentioned: if bread be given them, they chew and ſpit it out again, ſeldom chooſing to ſwallow it. They like ſalt beef and pork rather better; but they could never be brought to taſte ſpirits a ſecond time.

The huts of theſe ſavages are formed in the moſt rude and barbarous manner that can be imagined. They conſiſt only of pieces of bark laid together in the form of an oven, open at one end, and very low, though long enough for a man to lie at full length. There is reaſon, however, to believe, that they depend leſs on them for ſhelter than on the caverns with which the rocks abound. They go invariably naked, as has already been obſerved; though we muſt not imagine that the cuſtom of going naked inures them ſo to the climate as to make them inſenſible to the injuries of the weather. The coloniſts had repeated opportunities of obſerving this, by ſeeing them ſhivering with cold in the winter time, or huddling together in heaps in their huts or in caverns, till a fire could be kindled to warm them. It is probable, however, notwithſtanding their extreme barbarity, that ſome knowledge of the arts will ſoon be introduced among them, as ſome have been ſeen attentively conſidering the utenſils and conveniences of the Europeans, with a view, ſeemingly, of making ſimilar improvements of their own. It has alſo been obſerved, that in ſome things they poſſeſs a very great power of imitation. They can imitate the ſongs and language of the Europeans almoſt inſtantaneouſly, much better than the latter can imitate theirs by long practice. Their talent for imitation is alſo diſcernible in their ſculptures repreſenting men and other animals everywhere met with on the rocks; which, though rude, are very ſurpriſing for people who have not the knowledge even of conſtructing habitations in the leaſt comfortable for themſelves, or even clothes to preſerve them from the cold.

In their perſons, the New Hollanders are active, vigorous, and ſtout, though generally lean. Dampier aſſerts that they have a dimneſs of ſight; though later navigators have determined this to be a miſtake, aſcribing to them, on the contrary, a quick and piercing ſight. Their ſenſe of ſmelling is alſo very acute. One of them having touched a piece of pork, held out his finger for his companion to ſmell with ſtrong marks of diſguſt. The only kind of food they eagerly accept of is fiſh. Their behaviour with regard to the women has been hitherto unaccountable to the coloniſts. Few of them, comparatively ſpeaking, have been ſeen; and theſe have ſometimes kept back with the moſt jealous ſenſibility; ſometimes offered with the greateſt familiarity. Such of the females as have been ſeen, have ſoft and pleaſing voices; and notwithſtanding their barbariſm and exceſſive rudeneſs, ſeem not to be entirely deſtitute of modeſty.

The New Hollanders generally diſplay great perſonal bravery on the appearance of any danger. An old man, whom Governor Phillip had treated with ſome familiarity, took occaſion to ſteal a ſpade; but being taken in the fact, the governor gave him a few ſlight ſlaps on the ſhoulder; on which the old man caught hold of a ſpear, and coming up to him, ſeemed for ſome time determined to ſtrike, though had he done ſo, it would have been impoſſible for him to eſcape, being then ſurrounded by the officers and ſoldiers. No encounters between parties of the natives themſelves have been obſerved, though from ſome circumſtances it appears that wars are carried on among them. They have more than once been ſeen aſſembled as if bent on ſome expedition. An officer one day met 14 of them marching along in a regular Indian file through the woods, each man having a ſpear in one hand and a ſtone in the other. A chief appeared at their head, who was diſtinguiſhed from the reſt by being painted. They paſſed on peaceably, though greatly ſuperior in number to our people. On another occaſion they offered no hoſtilities when aſſembled to the number of 200 or 300, and meeting the governor attended only by a ſmall party. With all their courage, however, they are much afraid of a muſket, and almoſt equally ſo of a red coat, which they know to be the martial dreſs of the Europeans. The miſchief which they have hitherto done has been exerciſed only on ſome ſtraggling convicts, moſt of whom probably have been the firſt aggreſſors.

Though theſe ſavages allow their beards to grow to a conſiderable length, it does not appear that they look upon them to be any ornament, but rather the contrary, as appears from the following inſtance. Some young gentlemen belonging to the Sirius, one day met an old man in the woods with a beard of conſiderable length. This his new acquaintance let him know that they would rid him of, ſtroaking their chins, and ſhowing him the ſmoothneſs of them at the ſame time. At length the old fellow conſented; and one of the youngſters taking a penknife from his pocket, and making the beſt ſubſtitute for lather he could, performed the operation with ſuch ſucceſs, that the Indian ſeemed highly delighted. In a few days he paddled alongſide of the Sirius again, pointing to his beard; but could not by any means be prevailed upon to enter the ſhip. On this a barber was ſent down to him, who again freed him from his beard, at which he expreſſed the utmoſt ſatisfaction. It has, however, been found impoſſible to form any kind of permanent intercourſe with the natives, though many attempts have been made for that purpoſe; but in his letter above quoted, Governor Phillip declares that he has not the leaſt apprehenſion of their doing any damage to the colony. At firſt the coloniſts imagined the ſpears of the New Hollanders to be very trivial weapons; but it now appears that they are capable of inflicting very grievous and mortal wounds. They are ſometimes pointed with a ſharp piece of the ſame reed of which the ſhafts are made, but more frequently with the ſharp bone of the ſting-ray. They certainly burn their dead, which perhaps has given riſe to the report of their being cannibals. Governor Phillip, obſerving the ground to be raiſed in ſeveral places, cauſed one of theſe tumuli to be opened, in which were found a jaw-bone half conſumed and ſome aſhes. From the manner in which the aſhes are depoſited, it appears

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that the body has been laid at length, raiſed from the ground a little ſpace, and conſumed in that poſture, being afterwards lightly covered with mould.

The only domeſtic animals they have are the dogs already mentioned, which reſemble the fox-dog of England. In their language theſe animals are called *dingo;* but all other quadrupeds without exception they name *kangaroo.*—They ſeem very little given to thieving in compariſon with the inhabitants of moſt of the South Sea iſlands; and are very honeſt among themſelves, leaving their ſpears and other implements open on the beach, in full and perfect ſecurity of their remaining untouched. They are very expert at throwing their javelins, and will hit a mark with great certainty at a conſiderable diſtance; and it ſeems that ſometimes they kill the kangaroo with this weapon, as a long ſplinter of one of the ſpears was taken out of the thigh of one of theſe animals, the fleſh having cloſed over it completely. The people are more numerous than was at firſt imagined, though ſtill the number of inhabitants muſt be accounted few in compariſon to the extent of country; and there is great reaſon to believe that the interior parts are uninhabited.

The New Hollanders bake their proviſions by the help of hot ſtones, like the inhabitants of the South-ſea iſlands. They produce fire with great facility according to Captain Cook, but with difficulty according to later accounts, and ſpread it in a wonderful manner. To produce it, they take two pieces of dry ſoft wood: one is a ſtick about eight or nine inches long, the other piece is flat. The ſtick they ſhape into an obtuſe point at one end; and preſſing it upon the other, turn it nimbly, by holding it between both their hands, as we do a chocolate mill; often ſhifting their hands up, and then moving them down upon it, to increaſe the preſſure as much as poſſible. By this method they get fire in leſs than two minutes, and from the ſmalleſt ſpark they increaſe it with great ſpeed and dexterity. "We have often ſeen (ſays Captain Cook (one of them run along the ſhore, to all appearance with nothing in his hand, who ſtooping down for a moment, at the diſtance of every fifty or an hundred yards, left fire behind him, as we could ſee, firſt by the ſmoke, and then by the flame along the drift of wood and other litter which was ſcattered along the place. We had the curioſity to examine one of theſe planters of fire when he ſet off, and we ſaw him wrap up a ſmall ſpark in dry graſs, which when he had run a little way, having been fanned by the air that his motion produced, began to blaze; he then laid it down in a place convenient for his purpoſe, incloſing a ſpark of it in another quantity of graſs, and ſo continued his courſe."

27
State of the colony in 1797.

According to the moſt recent accounts we have ſeen reſpecting this country, the colony is already in as flouriſhing a ſtate as can be expected, conſidering the many difficulties with which every infant ſettlement has to ſtruggle for ſome time. At the cloſe of the year 1797, the colony had of live ſtock, 26 horſes, 58 mares, 132 bulls and oxen, 195 cows, 4247 hogs, 743 rams, 1714 ſheep, 781 he and 1495 ſhe goats. Of land in a ſtate of cultivation, there were 3361½ acres in wheat, 1527 for maize, and 26½ in barley, beſides a conſiderable quantity of garden ground, which produced potatoes, callevances, and vines.

The increaſe of public buildings belonging to the government was alſo very conſiderable. At Toongabbe a barn was erected 90 feet long, in which 18 men might thraſh corn, without interrupting each other. At Sydney, an entire new ſuite of apartments was built of brick, for the accommodation of the two aſſiſtant ſurgeons, and a jail 80 feet long was erected at the ſame place. Two wind-mills, and a granary 72 by 21 feet, were among the buildings of public utility, as well as an elegant church 100 by 44 feet, with a veſtry 20 feet long, erected upon pillars, beſides a great variety of other edifices and uſeful improvements. Theſe demonſtrate the parental care of the Britiſh government, and evince the proſperity of the colony to be rapidly advancing.

From the 27th of January 1788, to the 7th of June 1800, not fewer than 120 ſhips and veſſels of various deſcriptions, and from different quarters of the globe, have viſited this country; a convincing proof that they either found it a place of refreſhment after the fatigues of a long voyage, or an advantageous market for their commercial ſpeculations. Thirty-ſeven of them went from England with convicts, to the number of 5000, of whom about 157 were females.

Beſides the black ſwans already mentioned, which the ancients deſpaired of ever ſeeing, this country produces that beautiful bird called *menura ſuperba*, of which an intereſting deſcription is given by Mr Collins, in the ſecond volume of his Account of the Engliſh Colony. Here alſo there is a conſiderable number of very uncommon and exquiſitely fragrant ſhrubs. There is alſo an extraordinary amphibious animal found here, called the *ornithorynchus paradoxus*, of which Mr Home has given a deſcription, which was publiſhed in the Philoſophical Tranſactions for 1801.

In 1801, there were in circulation the following coins, which were made legal tenders by authority of the governor.

	L.	s.	d.
A guinea, - -	1	2	0
A johannes, - -	4	0	0
A half do. - - - -	2	0	0
A ducat, - -	0	9	6
A gold mohur, - -	1	17	6
A pagoda, - - -	0	8	0
A Spaniſh dollar, - -	0	5	0
A rupee, - - -	0	2	6
A Dutch gilder, - -	0	2	0
An Engliſh ſhilling, - -	0	1	1
A copper coin of 1 oz. - -	0	0	2
A do. of ½ oz. - -	0	0	1
A do. of ¼ oz. - - -	0	0	0½

In the year 1801 the increaſing proſperity of the colony was ſtill conſpicuous, for the live ſtock of different individuals conſiſted of 6269 ſheep, 362 cattle, 211 horſes, 1259 goats, and 4766 hogs; and what belonged to government conſiſted of 488 ſheep, 931 cattle, and 32 hogs. Individuals had 4857 acres of land ſown with wheat, and 3564 acres for maize; and government had 467 acres for the one ſpecies of grain, and 300 for the other. 28 In 1801.

In the month of June 1801, there were 5547 perſons of all deſcriptions in the ſettlement, which with 29 Population.

961

Plate CCLXI.

J. Bell Prin. Mal. Sculptor fecit.

961 at Norfolk island, made a total of 6508 persons subject to the governor's authority.

Holland, in commerce, a fine and close kind of linen, so called from its being first manufactured in Holland.

HOLLAR, Wenceslaus, a celebrated engraver, born at Prague in 1607. His parents were in a genteel line of life; and he was at first designed for the study of the law. But the civil commotions which happened in his youth, ruining his family affairs, he was obliged to shift for himself; and by discovering some genius for the arts, he was placed with Marian, a very able designer and engraver of views. Being himself a man of great ingenuity, he profited hastily from the instruction of his tutor. He principally excelled in drawing geometrical and perspective views and plans of buildings, ancient and modern cities and towns; also landscapes, and every kind of natural and artificial curiosities; which he executed with a pen in a very peculiar style, excellently well adapted to the purpose. He travelled through several of the great cities of Germany: and, notwithstanding all his merit, met with so little encouragement, that he found it very difficult to support himself. The earl of Arundel being in Germany, took him under his protection, brought him to England, and recommended him to the favour of Charles I. He engraved a variety of plates from the Arundel collection, and the portrait of the earl himself on horseback. The civil wars, which happened soon after in England, ruined his fortune. He was taken prisoner, with some of the royal party, and with difficulty escaped; when he returned to Antwerp, and joined his old patron the earl of Arundel. He settled in that city for a time, and published a considerable number of plates: but his patron going to Italy soon after for the benefit of his health, Hollar fell again into distress, and was obliged to work for the print and booksellers of Antwerp at very low prices. At the restoration he returned into England; where, though he had sufficient employment, the prices he received for his engravings were so greatly inadequate to the labour necessarily required, that he could but barely subsist, and the plague, with the succeeding fire of London, putting for some time an effectual stop to business, his affairs were so much embarrassed, that he was never afterwards able to improve his fortune. It is said that he used to work for the booksellers at the rate of fourpence an hour, and always had an hour glass before him. He was so very scrupulously exact, that when obliged to attend the calls of nature, or whilst talking, though with the persons for whom he was working, and about their own business, he constantly laid down the glass, to prevent the sand from running. Nevertheless, all his great industry, of which his numerous works bear ample testimony, could not procure him a sufficient maintenance. It is melancholy to add, that on the verge of his 70th year, he was attached with an execution at his lodgings in Gardener's lane, Westminster, when he desired only the liberty of dying in his bed, and that he might not be removed to any other prison than the grave, a favour which it is uncertain whether he obtained or not. He died, however, in 1677.—His works amount nearly to 24,000 prints, according to Vertue's Catalogue; and the lovers of art are always zealous to collect them. Generally speaking, they are etchings performed almost entirely with the point, and their merits are thus characterised by Mr Strutt: "They possess great spirit, with astonishing freedom and lightness, especially when we consider how highly he has finished some of them. His views of abbeys, churches, ruins, &c. with his shells, muffs, and every species of still life, are admirable; his landscapes frequently have great merit; and his distant views of towns and cities are not only executed in a very accurate, but a very pleasing manner." A somewhat colder character is given of them by Mr Gilpin in his Essay on Prints: "Hollar gives us views of particular places, which he copies with great truth, unornamented as he found them. If we are satisfied with exact representations, we have them nowhere better than in Hollar's works; but if we expect pictures, we must seek them elsewhere. Hollar was an antiquarian and a draughtsman, but seems to have been little acquainted with the principles of painting. Stiffness is his characteristic, and a painful exactness void of taste. His larger views are mere plans. In some of his smaller, at the expence of infinite pains, something of an effect is sometimes produced. But in general, we consider him as a repository of curiosities, a record of antiquated dresses, abolished ceremonies, and edifices now in ruins."

HOLLOA, in the sea-language, an exclamation of answer, to any person who calls to another to ask some question, or to give a particular order. Thus if the master intends to give any order to the people in the main-top, he previously calls, *Main top, hoay!* to which they answer, *Holloa!* to show that they hear him, and are ready. It is also the answer in hailing a ship at a distance. See Hailing.

HOLLY. See Ilex, Botany *Index*.

Sea-Holly, See Eryngium, Botany *Index*.

HOLM (Sax. *hulmus, insula amnica*), denotes an isle or fenny ground, according to Bede, or a river island. And where any place is called by that name, and this syllable is joined with any other in the names of places, it signifies a place surrounded with water, as the Flatholmes and Stepholmes in the Severn near Bristol; but if the situation of the place is not near the water, it may then signify a hilly place; *holm* in Saxon signifying also "a hill or cliff."

HOLOCAUST (formed from ὁλος "whole", and καιω "I consume with fire)", a kind of sacrifice, wherein the whole offering is burnt or consumed by fire, as an acknowledgement that God, the creator, preserver, and lord of all, was worthy of all honour and worship, and as a token of men's giving themselves entirely up to him. It is called also in Scripture a *burnt-offering*. Sacrifices of this sort are often mentioned by the heathens as well as Jews; particularly by Xenophon, *Cyroped.* lib. viii. p. 446. *ed. Hutchins.* 1738, who speaks of sacrificing holocausts of oxen to Jupiter, and of horses to the sun; and they appear to have been in use long before the institution of the other Jewish sacrifices by the law of Moses; (see Job i. 5. xii. 8. and Gen. viii. 20, xxii. 13.) On this account, the Jews, who would not allow the Gentiles to offer on their altar any other sacrifices peculiarly enjoined by the law of Moses, admitted them by the Jewish priests to offer holocausts; because these were a sort of sacrifices prior to the law, and common to all nations. During

ring their ſubjection to the Romans, it was no uncommon thing for thoſe Gentiles to offer ſacrifices to the God of Iſrael at Jeruſalem. Holocauſts were deemed by the Jews the moſt excellent of all their ſacrifices. It is ſaid, that this kind of ſacrifice was in common uſe among the heathens, till Prometheus introduced the cuſtom of burning only a part, and reſerving the remainder for his own uſe. See SACRIFICE.

HOLOFERNES, lieutenant general of the armies of Nabuchodonoſor king of Aſſyria, who having in a remarkable encounter overcome Arphaxad king of the Medes, ſent to all the neighbouring nations with an intention of obliging them this way to ſubmit to his empire, pretending that there could be no power capable of reſiſting him. At the ſame time Holofernes, at the head of a powerful army, paſſed the Euphrates, entered Cilicia and Syria, and ſubdued almoſt all the people of theſe provinces.

Being reſolved to make a conqueſt of Egypt, he advanced towards Judæa, little expecting to meet with any reſiſtance from the Jews. In the mean time, he was informed that they were preparing to oppoſe him; and Achior the commander of the Ammonites, who had already ſubmitted to Holofernes, and was with ſome auxiliary troops in his army, repreſented to him that the Hebrews were a people protected in a particular manner by God Almighty, ſo long as they were obedient to him; and therefore he ſhould not flatter himſelf with expectations of overcoming them, unleſs they had committed ſome offence againſt God, whereby they might become unworthy of his protection. Holofernes, diſregarding this diſcourſe, commanded Achior to be conveyed within ſight of the walls of Bethulia, and tied to a tree, and left there, whither the Jews came and looſed him.

In the mean time Holofernes formed the ſiege of Bethulia; and having cut off the water which ſupplied the city, and ſet guards at the only fountain which the beſieged had near the walls, the inhabitants were ſoon reduced to extremity, and reſolved to ſurrender if God did not ſend them ſuccours in five days. Judith, being informed of their reſolution, conceived the deſign of killing Holofernes in his camp. She took her fineſt clothes, and went out of Bethulia with her maid-ſervant; and being brought to the general, ſhe pretended that ſhe could no longer endure the ſins and exceſſes of the Jews, and that God had inſpired her with the deſign of ſurrendering herſelf to him. As ſoon as Holofernes ſaw her, he was taken with her beauty; and ſome days after invited her to a great feaſt, which he prepared for the principal officers of his army. But he drank ſo much wine, that ſleep and drunkenneſs hindered him from ſatisfying his paſſion. Judith, who in the night was left alone in his tent, cut off his head with his own ſword; and departing with her ſervant from the camp, ſhe returned to Bethulia with the head of Holofernes. As ſoon as it was day, the beſieged made a ſally upon their enemies, who going into their general's tent, found his headleſs carcaſe wallowing in its own blood. They then diſcerned that Judith had deceived them, and fled with precipitation, leaving the camp abounding with rich ſpoils; the Jews purſued them, killed a great number of them, and returned loaded with booty.

There is a great diverſity of opinions concerning the time when this war between Holofernes and the Jews happened. Some date it from the captivity of Babylon, in the reign of Manaſſeh, and pontificate of Eliakim the high-prieſt; others place it at ſome time after the captivity; and ſome doubt the truth of the whole tranſaction. See the article JUDITH.

HOLOGRAPHUM (compoſed of ὁλος "all," and γραφω "I write"), in the civil law, ſomething written wholly in the hand-writing of the perſon who ſigns it. The word is chiefly uſed in ſpeaking of a teſtament written wholly in the teſtator's own hand.

The Romans did not approve of holographic teſtaments; and, though Valentinian authoriſed them by a novel, they are not uſed where the civil law is in full force.

HOLOSTEUM, a genus of plants belonging to the triandria claſs; and in the natural method ranking under the 22d order, *Caryophyllei*. See BOTANY *Index*.

HOLOTHURIA, a genus of the order *vermes*, belonging to the claſs molluſca. See HELMINTHOLOGY *Index*.

HOLSTEIN, a duchy of Germany, bounded by the German ocean on the weſt; the Baltic, or the gulf of Lubeck, on the eaſt; the duchy of Mecklenburg on the ſouth-eaſt; that of Bremen, with the river Elbe, on the ſouth-weſt; and Lauenburg, with the territory of Hamburg, on the ſouth. Its greateſt length is about 80 miles, and its breadth 60. The dioceſe of Eutin, and the county of Ranzau, though they make a part of the duchy of Holſtein, yet being lands belonging to the empire and circle, ſhall be deſcribed ſeparately.

A great part of this country conſiſts of rich marſh land, which being much expoſed to inundations both from the ſea and rivers, dikes have been raiſed at a great expence to guard and defend them. The paſtures in the marſhes are ſo rich, that cattle are bred in vaſt numbers and fattened in them, and great quantities of excellent butter and cheeſe made of their milk. They are alſo very fruitful in wheat, barley, peaſe, beans, and rape-ſeed. In the more barren, ſandy, and heathy parts of the country, large flocks of ſheep are bred and fed: nor are orchards wanting, or woods, eſpecially of oak and beech; nor turf, poultry, game, and wild-fowl. Here is a variety both of ſea and river fiſh; and the beef, veal, mutton, and lamb, are very fat and palatable. Holſtein is alſo noted for beautiful horſes. The gentry uſually farm the cows upon their eſtates to a Holiander, as he is called, who for every cow pays from ſix to ten rix-dollars; the owner providing paſture for them in ſummer, and ſtraw and hay in winter. It is no uncommon thing here to drain the ponds and lakes once in three or four years, and ſell the carp, lampreys, pikes, and perch, found in them; then ſow them for ſeveral years after with oats, or uſe them for paſturage; and after that lay them under water again, and breed fiſh in them. There are hardly any hills in the country; but ſeveral rivers, of which the principal are the Eyder, the Stor, and the Trave. The duchy contains about 30 towns great and ſmall; moſt part of the peaſants are under villenage, being obliged to work daily for their lords, and not even at liberty to quit their eſtates. The nobility and the proprietors of of manors are possessed of the civil and criminal jurisdiction, with other privileges and exemptions. Formerly there were diets, but now they seem to be entirely laid aside: meetings, however, of the nobility are still held at Kiel. The predominant religion here is Lutheranism, with superintendencies as in other Lutheran countries. In several places the Jews are allowed the exercise of their religion. At Gluckstadt and Altena are both Calvinist and Popish churches; and at Kiel a Greek Russian chapel. Besides the Latin schools in the towns, at Altena is a gymnasium, and at Kiel an university. Notwithstanding this country's advantageous situation for commerce, there are few manufactures and little trade in it. Hamburg and Lubeck supply the inhabitants with what they want from abroad; from whence and Altena they export some grain, malt, grots, starch, buck-wheat, pease, beans, rape-seed, butter, cheese, sheep, swine, horned cattle, horses, and fish. The manufactures of the duchy are chiefly carried on at Altena, Kiel, and Gluckstadt. The duchy of Holstein consists of the ancient provinces of Holstein, Stormar, Ditmarsh, and Wagria. It belongs partly to the king of Denmark and partly to the dukes of Holstein Gottorf and Ploen. Anciently the counts of Holstein were vassals of the dukes of Saxony; but afterwards they received the investiture of their territories from the emperor, or the bishops of Lubeck in the emperor's name, though the investiture was afterwards given by the emperor in person. The king of Denmark appoints a regency over his part of Holstein and the duchy of Sleswick, which has its office at Gluckstadt. The seat of the great duke's privy council and regency-court, together with the chief consistory, which is united to it, is at Kiel: there are many inferior courts and consistories, from which an appeal lies to the higher. In the duchy of Holstein, the government of the convents and nobility is alternately in the king and duke for a year, from Michaelmas to Michaelmas. The person in whom the government is lodged administers it by his regency. In some cases an appeal lies from this court to the Aulic council or chamber at Wetzlar: the convents, the nobility, and the proprietors of manors in the country, have a civil and criminal jurisdiction over their estates. The revenues of the sovereigns arise principally from their demesnes and regalia; besides which, there is a land and several other taxes and imposts. The duke's income, setting aside his ducal patrimony, has been estimated at 70,000 or 80,000 pounds. The king usually keeps here some regiments of foot and one of horse. With respect to the duke's military force, it amounts to about 800 men. The king, on account of his share in this country, styles himself *duke of Holstein*, *Stormar*, and *Ditmarsh*. The dukes both of the royal and princely house style themselves *heirs of Norway*, *dukes of Slefwick*, *Holstein*, *Stormar*, and *Ditmarsh*, and counts of *Oldenburg* and *Delmenhorst*. On account of Holstein, both the king of Denmark and the grand duke have a seat and voice in the college of the princes of the empire, and in that of the circle. Together with Mecklenburg they also nominate an assessor for this circle in the Aulic chamber. The matricular assessment of the whole duchy is 40 horse and 80 foot, or 800 florins; to the chamber of Wetzlar both princes pay 189 rix-dollars, 31 kruitzers. In 1735, duke Charles Frederic of Holstein Gottorf founded an order of knighthood here, viz. that of St Anne, the ensign of which is a red cross, enamelled, and worn pendant at a red ribbon edged with yellow.—The principal places of that part of the duchy belonging to the king of Denmark and the duke of Ploen are Gluckstadt, Itzhoe, Rendsburg, and Ploen; and that part belonging to the great duke are Kiel, Oldenburg, Preetz, and Altena.

HOLT, Sir John, knight, eldest son of Sir Thomas Holt, serjeant-at-law, was born in 1642. He entered himself of Gray's Inn in 1658; and applied to the common law with so much industry, that he soon became a very eminent barrister. In the reign of James II. he was made recorder of London, which office he discharged with much applause for about a year and a half; but lost his place for refusing to expound the law suitably to the king's designs. On the arrival of the prince of Orange, he was chosen a member of the convention parliament, which afforded him a good opportunity of displaying his abilities; so that, as soon as the government was settled, he was made lord chief justice of the court of king's bench, and a privy counsellor. He continued chief justice for 22 years, with great repute for steadiness, integrity, and thorough knowledge in his profession. Upon great occasions he asserted the law with intrepidity, though he thereby ventured to incur by turns the indignation of both the houses of parliament. He published some reports, and died in 1709.

Holt (Sax.) " a wood;" wherefore the names of towns beginning or ending with *holt*, as *Buck-holt*, &c. denote that formerly there was great plenty of wood in those places.

HOLY. See Holiness.

HOLY-GHOST, one of the persons of the holy Trinity. See Trinity.

Order of the Holy Ghost, the principal military order in France, instituted by Henry III. in 1569. It consists of 100 knights, who are to make proof of their nobility for three descents. The king is the grand-master or sovereign; and as such takes an oath on his coronation-day to maintain the dignity of the order.

The knights wear a golden cross, hung about their necks by a blue silk ribbon or collar. But before they receive the order of the Holy-Ghost, that of St Michael is conferred as a necessary degree; and for this reason their arms are surrounded with a double collar.

HOLYHEAD, a town and cape of the isle of Anglesea in Wales, and in the Irish channel, where people usually embark for Dublin, there being three packet-boats that sail for that city every Monday, Wednesday, and Friday, wind and weather permitting. It is 276 miles from London, and has a very convenient harbour for the northern trade, when taken short by contrary winds. It is situated near the extremity of the isle, and is joined to the north-west part of it by a stone bridge of one arch. It has a small market on Saturdays. The parish is about five or six miles long, and two or three broad, bounded nearly by the sea. The church stands above the harbour, within an old quadrangular fortification, with a bastion at each corner built about 450. On a mountain near it is another old fortification called Turris Munimentum, which

Holyhead, Holy-Island.

which is an old ſtone wall without mortar, and in its centre is a ſmall turret, and contains a well of water. Holyhead was frequently formerly viſited by Iriſh rovers, and was defended as a place of conſequence. There are ſeveral remains of old fortifications and Druidical antiquities in its neighbourhood, as well as chapels of religious worſhip. The pariſh church of Holyhead was built in the reign of Edward III. and is in the form of a croſs, with a porch and ſteeple very antique. There was an old chapel near the church, now converted into a ſchool-houſe. A ſalt-houſe was erected on an iſland in the harbour in Queen Anne's reign, but it is now in ruins. The town is little more than a fiſhing town, rendered conſiderable by being the place of paſſage to Ireland. It has three good inns. The paſſage hence to Ireland is in general about twelve hours. There is no freſh water here except from rain, nor any bread ſold but what comes from Ireland. A bath and aſſembly-room were erected here in 1770. Under the mountains that overhang the town is a large cavern in the rock, ſupported by natural pillars, called the Parliament-houſe, acceſſible only by boats, and the tide runs into it. If this harbour was properly repaired, and ware-houſes built, it would be very convenient for the Iriſh to import ſuch of their goods as pay Engliſh duty, it being but a few hours ſail from Dublin. Beſides, the Dublin merchants might come over with the packets to ſee their goods landed. The commodities are, butter, cheeſe, bacon, wild-fowl, lobſters, crabs, oyſters, razor-fiſh, ſhrimps, herrings, cod-fiſh, whitings, whiting-pollacks, cole-fiſh, ſea-tenches, turbots, ſoles, flounders, rays, and plenty of other fiſh. On the rocks the herb grows of which they make kelp, a fixed ſalt uſed in making glaſs, and in alum works. In the neighbourhood there is a large vein of white fullers earth and another of yellow, which might be uſeful to fullers. On the iſle of Skerries, nine miles to the north, is a light-houſe, which may be ſeen 24 miles off. Large flocks of puffins are often ſeen here; they all come in one night, and depart in the ſame manner.

HOLY-ISLAND, a ſmall iſland lying on the coaſt of England, 10 miles ſouth-eaſt of Berwick, in Northumberland. Bede calls it a *ſemi-iſland*, being, as he obſerves, twice an iſland and twice continent in one day: for at the flowing of the tide, it is encompaſſed by water; and at the ebb, there is an almoſt dry paſſage, both for horſes and carriages, to and from the main land; from which, if meaſured on a ſtraight line, it is diſtant about two miles eaſtward; but on account of ſome quickſands paſſengers are obliged to make ſo many detours, that the length of way is nearly doubled. The water over theſe flats at ſpring-tides is only ſeven feet deep.—This iſland was by the Britons called *Inis Medicante;* alſo *Lindisfarne*, from the ſmall rivulet of Lindi or Landia, which here runs into the ſea, and the Celtic word *fahren* or "receſs;" and on account of its being the habitation of ſome of the firſt monks in this country, it afterwards obtained its preſent name of *Holy-iſland.* It meaſures from eaſt to weſt about two miles and a quarter, and its breadth from north to ſouth is ſcarcely a mile and a half. At the north-weſt part there runs out a ſpit of land of about a mile in length. The monaſtery is ſituated at the ſouthermoſt extremity; and at a ſmall diſtance north of it ſtands the village. On this iſland there is plenty of fiſh and

Holy-Iſland, Holy-well.

fowl; but the air and ſoil are bad. There is not a tree on the iſland. The village, which ſtands on a riſing ground, conſiſts but of a few ſcattered houſes, chiefly inhabited by fiſhermen; and it has two inns. The north and eaſt coaſts are formed of perpendicular rocks, the other ſides ſink by gradual ſlopes to the ſands. There is a commodious harbour, defended by a block-houſe; which laſt was ſurpriſed and taken in 1715, but was ſoon inveſted and retaken.

Holy-iſland, though really part of Northumberland, belongs to Durham; and all civil diſputes muſt be determined by the juſtices of that county.—It was a very ancient epiſcopal ſeat. Aidan the firſt biſhop, after preſiding in it 14 years, died and was buried here A. D. 651. Finan, his ſucceſſor, built a wooden church, thatched with reeds, but before the end of the century covered with lead by Biſhop Eadbert. St Cuthbert, who from a poor ſhepherd became monk of Melroſs 15 years, was prior here 12 more, when he retired to one of the barren Farn rocks, from whence he was called to this ſee, which he held only two years, and returned to his retirement, where he died, and was buried at the eaſt end of his oratory, where his ſtone coffin is ſtill ſhown. His body was found freſh 11 years after his death. Lindisfarne was ruined by the Danes, A. D. 793, when the monks carried his body about for ſeven years, and at laſt ſettled at Cheſter-le-ſtreet, whither the ſee was tranſlated, and where it continued many years. On a ſecond deſtruction of the monaſtery by the Danes they were removing to Rippon, but ſtopped by a miracle at Durham, where the ſaint continued till the reformation, when his body was found entire, and privately buried in a wooden coffin, as ſome pretend, near the clock, but more probably in the ground under where his ſhrine ſtood. The entrochi found among the rocks at Lindisfarne are called St Cuthbert's beads, and pretended to be made by him in the night. Eighteen biſhops ſat here till the removal of the ſee to Cheſter, which had eight more till the removal to Durham, A. D. 995. Lindisfarne became a cell to that Benedictine monaſtery, valued at 48l. per ann. The north and ſouth walls of the church are ſtanding, much inclined; part of the weſt end remains, but the eaſt is down. The columns of the nave are of four different ſorts, 12 feet high and 5 feet diameter, maſſy and richer than thoſe of Durham; the baſes and capitals plain, ſupporting circular arches. Over each arch are large windows in pairs, ſeparated by a ſhort column, and over theſe are ſmaller ſingle windows. In the north and ſouth walls are ſome pointed arches. The length of the body is 138 feet, breadth 18 feet, and with the two ailes 36 feet; but it may be doubted whether there ever was a tranſept. One arch of the centre tower remains adorned, as is its entrance from the nave, with Saxon zigzag. Somewhat to the eaſt is the baſe of a croſs, and to the weſt the preſent pariſh-church.

HOLY-Rood Day, a feſtival obſerved by the Roman Catholics, in memory of the exaltation of our Saviour's croſs. See CROSS and EXALTATION.

HOLY-Well, a town of North Wales, in the county of Flint. It is a place of great note, for the well of St Winnifred, who was reputed a virgin martyr; and it is much frequented by people that come to bathe in it, as well as by popiſh pilgrims out of devotion. The

ſpring

ſpring guſhes forth with ſuch impetuoſity, that at a ſmall diſtance it turns ſeveral mills. Over the ſpring is a chapel built upon pillars, and on the windows is painted the hiſtory of St Winnifred's life. There is a moſs about the well, which ſome fooliſhly imagine to be St Winnifred's hair. W. Long. 3. 15. N. Lat. 54. 21.

HOMAGE, in *Law*, is the ſubmiſſion, loyalty, and ſervice, which a tenant promiſed to his lord when he was firſt admitted to the land which he held of the lord in fee: alſo that owing to a king, or to any ſuperior.

HOMBERG, William, a celebrated phyſician, chemiſt, and philoſopher, was the ſon of a Saxon gentleman, and born in Batavia, in the Eaſt Indies, in 1652. His father afterwards ſettling at Amſterdam, William there proſecuted his ſtudies; and from thence removed to Jena, and afterwards to Leipſic, where he ſtudied the law. In 1642, he was made advocate at Magdeburg, and there applied himſelf to the ſtudy of experimental philoſophy. Some time after he travelled into Italy; and applied himſelf to the ſtudy of medicine, anatomy, and botany, at Padua. He afterwards ſtudied at Bologna; and at Rome learned optics, painting, ſculpture, and muſic. He at length travelled into France, England, and Holland; obtained the degree of doctor of phyſic at Wirtemberg; travelled into Germany and the North; viſited the mines of Saxony, Bohemia, Hungary, and Sweden; and returned to France, where he acquired the eſteem of the learned. He was on the point of returning into Germany, when M. Colbert being informed of his merit, made him ſuch advantageous offers, as induced him to fix his reſidence at Paris. M. Homberg, who was already well known for his phoſphorus, for a pneumatic machine of his own invention more perfect than that of Guericke, for his microſcopes, for his diſcoveries in chemiſtry, and for the great number and variety of his curious obſervations, was received into the academy of ſciences in 1691, and had the laboratory of that academy, of which he was one of the principal ornaments. The duke of Orleans, afterwards regent of the kingdom, at length made him his chemiſt, ſettled upon him a penſion, gave him the moſt ſuperb laboratory that was ever in the poſſeſſion of a chemiſt, and in 1704 made him his firſt phyſician. He had abjured the Proteſtant religion in 1682, and died in 1715. There are a great number of learned and curious pieces of his writing, in the memoirs of the academy of ſciences, and in ſeveral journals. He had begun to give the elements of chemiſtry in the memoirs of the academy, and the reſt were found among his papers fit for printing.

Homberg, a town of Germany, in the circle of the Upper Rhine, and landgravate of Heſſe, ſeated ten miles north of Frankfort, and gives title to one of the branches of the houſe of Heſſe, who is its ſovereign. E. Long. 8. 24. N. Lat. 50. 20.

Homberg, a town of Germany, in the palatinate of the Rhine, and duchy of Deuxponts. E. Long. 7. 6. N. Lat. 49. 20.

HOME, Henry, Lord Kames, an eminent Scottiſh lawyer, and author of many celebrated works on various ſubjects, was deſcended of a very honourable and ancient family, and born in the year 1696. Lord Kames's grandfather, Henry Home, was a younger ſon of Sir John Home of Renton, who held the high office of lord juſtice-clerk, or chief criminal judge of Scotland, in the year 1663. He received the eſtate of Kames from his uncle George, brother to the then lord juſtice-clerk. The family of Renton is deſcended from that of the earls of Home, the repreſentatives of the ancient princes of Northumberland, as appears from the records of the Lion Office.

The county of Berwick in Scotland has the honour of having given birth to this great and uſeful member of ſociety. In early youth he was lively, and eager in the acquiſition of knowledge. He never attended a public ſchool; but was inſtructed in the ancient and modern languages, as well as in ſeveral branches of mathematics, and the arts neceſſarily connected with that ſcience, by Mr Wingate, a man of conſiderable parts and learning, who ſpent many years as preceptor or private tutor to Mr Home.

After ſtudying, with acuteneſs and diligence, at the univerſity of Edinburgh, the civil law, and the municipal law of his own country, Mr Home early perceived that a knowledge of theſe alone is not ſufficient to make an accompliſhed lawyer. An acquaintance with the forms and practical buſineſs of courts, and eſpecially of the ſupreme court, as a member of which he was to ſeek for fame and emolument, he conſidered as eſſentially neceſſary to qualify him to be a complete barriſter. He accordingly attended for ſome time the chamber of a writer to the ſignet, where he had an opportunity of learning the ſtyles of legal deeds, and the modes of conducting different ſpecies of buſineſs. This wiſe ſtep, independently of his great genius and unwearied application, procured him, after his admiſſion to the bar, peculiar reſpect from the court, and proportional employment in his profeſſion of an advocate. Whoever peruſes the law-papers compoſed by Mr Home when a young man, will perceive an uncommon elegance of ſtyle, beſides great ingenuity of reaſoning, and a thorough knowledge of the law and conſtitution of his country. Theſe qualifications, together with the ſtrength and vivacity of his natural abilities, ſoon raiſed him to be an ornament to the Scottiſh bar; and, on the 2d day of February 1752, he was advanced to the bench as one of the judges of the court of ſeſſion, under the title of *Lord Kames*.

Before this period, however, notwithſtanding the unavoidable labours of his profeſſion, Mr Home had favoured the world with ſeveral uſeful and ingenious works. In the year 1728, he publiſhed Remarkable Deciſions of the Court of Seſſion from 1716 to 1728, in one volume folio.—In 1732 appeared Eſſays upon ſeveral ſubjects in law, viz. *Jus tertii; Beneficium cedendarum actionum; Vinco Vincentem;* and *Preſcription;* in one volume 8vo. This firſt produce of his original genius, and of his extenſive views, excited not only the attention, but the admiration of the judges, and of all the other members of the college of juſtice. This work was ſucceeded, in the year 1741, by Deciſions of the Court of Seſſion from its firſt inſtitution to the year 1740, abridged and digeſted under proper heads, in form of a Dictionary, in two volumes folio: A very laborious work, and of the greateſt utility to every practical lawyer. In 1747 appeared Eſſays upon

upon ſeveral ſubjects concerning Britiſh antiquities, viz. 1. Introduction of the feudal law into Scotland. 2. Conſtitution of parliament. 3. Honour, Dignity. 4. Succeſſion, or Deſcent; with an appendix upon hereditary and indefeaſible right, compoſed anno 1745, and publiſhed 1747, in one volume 8vo. In a preface to this work, Lord Kames informs us, that in the years 1745 and 1746, when the nation was in great ſuſpenſe and diſtraction, he retired to the country; and in order to baniſh as much as poſſible the uneaſineſs of his mind, he contrived the plan, and executed this ingenious performance.

Though not in the order of time, we ſhall continue the liſt of all our author's writings on law, before we proceed to his productions on other ſubjects. In 1757, he publiſhed The Statute Law of Scotland abridged, with hiſtorical notes, in one volume 8vo; a moſt uſeful and laborious work. In the year 1759, he preſented to the public a new work under the title of Hiſtorical Law Tracts, in one volume 8vo. It contains 14 intereſting tracts, viz. Hiſtory of the Criminal Law:—Hiſtory of Promiſes and Covenants:—Hiſtory of Property:—Hiſtory of Securities under and for Payment of Debt:—Hiſtory of the Privilege which an Heir-apparent in a feudal holding has to continue the Poſſeſſion of his Anceſtor:—Hiſtory of Regalities, and of the Privilege of repledging:—Hiſtory of Courts:—Hiſtory of Brieves:—Hiſtory of Proceſs in abſence:—Hiſtory of Execution againſt Moveables and Land for Payment of Debt:—Hiſtory of Perſonal Execution for Payment of Debt:—Hiſtory of Execution for obtaining Payment after the Death of the Debtor:—Hiſtory of the limited and univerſal Repreſentation of Heirs:—Old and New Extent. In 1760, he publiſhed, in one volume folio, The Principles of Equity; a work which ſhows both the fertility of the author's genius and his indefatigable application. In 1766, he gave to the public another volume in folio of Remarkable Deciſions of the Court of Seſſion, from 1730 to 1752. In 1777, appeared his Elucidations reſpecting the Common and Statute Law of Scotland, in one volume 8vo. This book contains many curious and intereſting remarks upon ſome intricate and dubious points which occur in the law of Scotland. In 1780, he publiſhed a volume in folio of Select Deciſions of the Court of Seſſion from 1752 to 1768.

From this ſketch of Lord Kames's compoſitions and collections with a view to improve and elucidate the laws of Scotland, the reader may form ſome idea of his great induſtry, and of his anxious deſire to promote the honour and welfare of his country. It remains to be remarked, that in the ſupreme court there, the law-writings of Lord Kames are held in equal eſtimation, and quoted with equal reſpect, as thoſe of Coke or Blackſtone in the courts of England.

Lord Kames's mind was very much inclined to metaphyſical diſquiſitions. When a young man, in order to improve himſelf in his favourite ſtudy, he correſponded with the famous Berkeley biſhop of Cloyne, Dr Butler biſhop of Durham, Dr Samuel Clark, and many other ingenious and learned men both in Britain and Ireland. The letters of correſpondence, we are happy to learn, have been carefully preſerved by his ſon and heir George Home-Drummond, Eſq. of Blair-Drummond.

The year 1751 gave birth to the firſt fruits of his lordſhip's metaphyſical ſtudies, under the title of Eſſays on the Principles of Morality and Natural Religion, in two parts. Though a ſmall volume, it was replete with ingenuity and acute reaſoning, excited general attention, and gave riſe to much controverſy. It contained, in more explicit terms than perhaps any other work of a religious theiſt then known in Scotland, the doctrine which has of late made ſo much noiſe under the appellation of *philoſophical neceſſity*. The ſame thing had indeed been taught by Hobbes, by Collins, and by the celebrated David Hume, Eſq. but as thoſe authors either were profeſſed infidels, or were ſuppoſed to be ſuch, it excited, as coming from them, no wonder, and provoked for a time very little indignation. But when a writer, who exhibited no ſymptoms of extravagant ſcepticiſm, who inſinuated nothing againſt the truth of revelation in general, and who inculcated with earneſtneſs the great duties of morality and natural religion, advanced at the ſame time ſo uncommon a doctrine as that of *neceſſity*; a number of pens were immediately drawn againſt him, and for a while the work and its author were extremely obnoxious to a great part of the Scottiſh nation. On the other hand, there were ſome, and thoſe not totally illiterate, who, confounding *neceſſity* with *predeſtination*, complimented Mr Home on his maſterly defence of the eſtabliſhed faith: and though between theſe two ſchemes there is no ſort of reſemblance, except that the future happineſs or miſery of all men is, according to both, certainly foreknown and appointed by God; yet we remember, that a profeſſor in a diſſenting academy ſo far miſtook the one for the other, that he recommended to his pupils the Eſſays on Morality and Natural Religion, as containing a complete vindication of the doctrine of Calvin. For this miſtake he was diſmiſſed from his office, and excluded from the communion of the ſect to which he belonged. Lord Kames, like many other great and good men, continued a Neceſſarian to the day of his death; but in a ſubſequent edition of the Eſſays, he exhibited a remarkable proof of his candour and liberality of ſentiment, by altering the expreſſions, which, contrary to his intention, had given ſuch general offence.

In 1761, he publiſhed an *Introduction to the Art of Thinking*, in one volume 12mo. This ſmall but valuable book was originally intended for the inſtruction of his own family. The plan of it is both curious, amuſing, and highly calculated to catch the attention and to improve the minds of youth. It conſiſts of maxims collected from Rochefoucault and many other authors. To illuſtrate theſe maxims, and to rivet their ſpirit and meaning in the minds of young perſons, his lordſhip has added to moſt of them beautiful ſtories, fables, and hiſtorical anecdotes.

In the department of belles lettres, his *Elements of Criticiſm* appeared in 1762, in three volumes 8vo. This valuable work is the firſt and a moſt ſucceſſful attempt to ſhew, that the art of criticiſm is founded on the principles of human nature. Such a plan, it might be thought, ſhould have produced a dry and phlegmatic performance. Lord Kames, on the contrary, from the ſprightlineſs of his manner of treating every ſubject he handled, has rendered the Elements of Criticiſm not only highly inſtructive, but one of the moſt entertaining books in our language. Before this

work

work was publiſhed, Rollin's Belles Lettres, a dull performance, from which a ſtudent could derive little advantage, was univerſally recommended as a ſtandard; but, after the Elements of Criticiſm were preſented to the public, Rollin inſtantly vaniſhed, and gave place to greater genius and greater utility. With regard to real inſtruction and genuine taſte in compoſition of every kind, a ſtudent, a gentleman, or a ſcholar, can in no language find ſuch a fertile field of information. Lord Kames, accordingly, had the happineſs of ſeeing the good effects of his labours, and of enjoying for twenty years a reputation which he ſo juſtly merited.

A ſtill farther proof of the genius and various purſuits of this active mind was given in the year 1772, when his lordſhip publiſhed a work in one volume 8vo, under the title of *The Gentleman Farmer, being an attempt to improve Agriculture by ſubjecting it to the teſt of rational principles.* Our limits do not permit us to give details; but, with regard to this book, we muſt inform the public, that all the intelligent farmers in Scotland uniformly declare, that, after peruſing Young, Dickſon, and a hundred other writers on agriculture, Lord Kames's *Gentleman Farmer* contains the beſt practical and rational information on the various articles of huſbandry which can any where be obtained. As a practical farmer, Lord Kames has given many obvious proofs of his ſkill. After he ſucceeded, in right of his lady, to the ample eſtate of Blair-Drummond in the county of Perth, he formed a plan for turning a large moſs, conſiſting of at leaſt 1500 acres, into arable land. His lordſhip had the pleaſure, before he died, to ſee the plan ſucceſsfully, though only partially executed. The ſame plan was afterwards carried on in a much more rapid manner by his ſon George Drummond, Eſq. But as this is not a proper place for details of this nature, we muſt refer the reader to the article AGRICULTURE; where a particular account of this extraordinary, but extenſively uſeful, operation is given.

In the year 1773, Lord Kames favoured the world with *Sketches of the Hiſtory of Man*, in 2 vols 4to. This work conſiſts of a great variety of facts and obſervations concerning the nature of man; the produce of much and profitable reading. In the courſe of his ſtudies and reaſonings, he had amaſſed a vaſt collection of materials. Theſe, when conſiderably advanced in years, he digeſted under proper heads, and ſubmitted them to the conſideration of the public. He intended that this book ſhould be equally intelligible to women as to men; and, to accompliſh this end, when he had occaſion to quote ancient or foreign books, he uniformly tranſlated the paſſages. The *Sketches* contain much uſeful information; and, like all his lordſhip's other performances, are lively and entertaining.

We now come to Lord Kames's laſt work, to which he modeſtly gives the title of *Looſe Hints upon Education, chiefly concerning the culture of the heart.* It was publiſhed in the year 1781, in one vol. 8vo, when the venerable and aſtoniſhing author was in the 85th year of his age. Though his lordſhip choſe to call them *Looſe Hints*, the intelligent reader will perceive in this compoſition an uncommon activity of mind at an age ſo far advanced beyond the uſual period of human life, and an earneſt deſire to form the minds of youth to honour, to virtue, to induſtry, and to a veneration of the Deity.

Beſides the books we have enumerated, Lord Kames publiſhed many temporary and fugitive pieces in different periodical works. In the *Eſſays Phyſical and Literary*, publiſhed by a ſociety of gentlemen in Edinburgh, we find compoſitions of his lordſhip *On the Laws of Motion*, *On the Advantages of Shallow Ploughing*, and on *Evaporation*; all of which exhibit evident marks of genius and originality of thinking.

How a man employed through life in public buſineſs, and in buſineſs of the firſt importance, could find leiſure for ſo many different purſuits, and excel in them (A), it is not eaſy for a meaner mind to form even a conception. Much, no doubt, is to be attributed to the ſuperiority of his genius; but much muſt likewiſe have been the reſult of a proper diſtribution of his time. He roſe early; when in the vigour of life at four o'clock, in old age at ſix; and ſtudied all morning. When the court was ſitting, the duties of his office employed him from eight or nine till twelve or one; after which, if the weather permitted, he walked for two hours with ſome literary friends, and then went home to dinner. Whilſt he was on the bench, and we believe when he was at the bar, he neither gave nor accepted invitations to dinner during the *term* or *ſeſſion*; and if any friend came uninvited to dinner with him, his lordſhip diſplayed his uſual cheerfulneſs and hoſpitality, but always retired with his clerk as ſoon as he had drunk a very few glaſſes of wine, leaving his company to be entertained by his lady. The afternoon was ſpent as the morning had been, in ſtudy. In the evening he went to the theatre or the concert, from which he returned to the ſociety of ſome men of learning, with whom he ſat late, and diſplayed ſuch talents for converſation as are not often found. It is obſerved by a late celebrated author, that "to read, write, and converſe, in due proportions, is the buſineſs of a man of letters; and that he who hopes to look back hereafter with ſatisfaction upon paſt years, muſt learn to know the value of ſingle minutes, and endeavour to let no particle of time fall uſeleſs to the ground." It was by practiſing theſe leſſons that Lord Kames roſe to literary eminence, in oppoſition to all the obſtacles which the tumult of public buſineſs could place in his way.

To give a proper delineation of the public and pri-

(A) Upon reflecting on the ſtudiouſneſs of Lord Kames's diſpoſition, and his numerous literary productions, the reader will naturally recal to his mind a ſtriking ſimilarity between his lordſhip and the laborious Pliny the Elder. In a letter from Pliny the Younger to Macer, the following paſſage occurs, which is equally applicable to both: *Nonne videtur tibi, recordanti quantum legerit, quantum ſcripſerit, nec in officiis ullis, nec in amicitia principum fuiſſe?* which is thus tranſlated by Melmoth: "When you reflect on the books he has read and the volumes he has written, are you not inclined to ſuſpect, that he never was engaged in the affairs of the public, or the ſervice of his prince?"

vate character of Lord Kames, would far exceed our limits. The writer of this article, however, who had the honour of an intimate acquaintance with this great and good man for more than twenty years, must be indulged in adding a few facts which fell under his own observation.

Lord Kames was remarkable for public spirit, to which he conjoined activity and great exertion. He for a long tract of time had the principal management of all the societies and boards for promoting the trade, fisheries, and manufactures, in Scotland. As conducive to those ends, he was a strenuous advocate for making and repairing turnpike roads through every part of the country. He had likewise a chief lead in the distribution and application of the funds arising from the estates in Scotland which had unfortunately been annexed to the crown. He was no less zealous in supporting, both with his writings and personal influence, literary associations. He was in some measure the parent of what was called the Physical and Literary Society. This society was afterwards incorporated into the *Royal Society of Edinburgh*, which received a charter from the crown, and which is daily producing marks of genius, as well as works of real utility.

As a private and domestic gentleman, Lord Kames was admired by both sexes. The vivacity of his wit, and of his animal spirits, even when advanced in years, rendered his company not only agreeable, but greatly solicited by the literati, and courted by ladies of the highest rank and accomplishments. He told very few stories; and rarely, if ever, repeated the same story to the same person. From the necessity of retailing anecdotes, the miserable refuge of those who, without genius, attempt to shine in conversation, the abundance of his own mind set him free; for his wit or his learning always suggested what the occasion required. He could with equal ease and readiness combat the opinions of a metaphysician, unravel the intricacies of law, talk with a farmer on improvements in agriculture, or estimate with a lady the merits of the dress in fashion. Instead of being jealous of rivals, the characteristic of little minds, Lord Kames suffered and encouraged every symptom of merit that he could discover in the scholar, or in the lowest mechanic. Before he succeeded to the estate of Blair-Drummond, his fortune was small. Notwithstanding this circumstance, he, in conjunction with Mrs Drummond, his respectable and accomplished spouse, did much more service to the indigent than most families of greater opulence. If the present necessity was pressing, they gave money. They did more: When they discovered that male or female petitioners were capable of performing any art or labour, both parties exerted themselves in procuring that species of work which the poor people could perform. In cases of this kind, which were very frequent, the lady took charge of the women and his lordship of the men. From what has been said concerning the various and numerous productions of his genius, it is obvious that there could be few idle moments in his long protracted life. His mind was incessantly employed; either teeming with new ideas, or pursuing active and laborious occupations. At the same time, with all this intellectual ardour, one great feature in the character of Lord Kames, beside his literary talents and his public spirit, was a remarkable innocency of mind. He not only never indulged in detraction, but when any species of scandal was exhibited in his company, he either remained silent, or endeavoured to give a different turn to the conversation. As natural consequences of this amiable disposition, he never meddled with politics, even when parties ran to indecent lengths in this country; and what is still more remarkable, he never wrote a sentence, notwithstanding his numerous publications, without a direct and a manifest intention to benefit his fellow creatures. In his temper he was naturally warm, though kind and affectionate. In the friendships he formed, he was ardent, zealous, and sincere. So far from being inclined to irreligion, as some ignorant bigots insinuated, few men possessed a more devout habit of thought. A constant sense of Deity, and a veneration for Providence, dwelt upon his mind. From this source arose that propensity which appears in all his writings, of investigating final causes, and tracing the wisdom of the Supreme Author of nature. But here we must stop. Lord Kames, to the great regret of the public, died on the 27th day of December 1782. As he had no marked disease but the debility necessarily resulting from extreme old age, a few days before his death he went to the Court of Session, addressed all the judges separately, told them he was speedily to depart, and took a solemn and an affectionate farewell.

HOMER, the prince of the Greek poets, flourished, according to Dr Blair, about 900 B. C. according to Dr Priestley 850, according to the Arundelian marbles 300, after the taking of Troy; and agreeable to them all, above 400 years before Plato and Aristotle. Seven cities disputed the glory of having given him birth, viz. Smyrna, Rhodes, Colophon, Salamis, Chios, Argos, and Athens; which has been expressed by the following distich:

Smyrna, Rhodes, Colophon, Salamis, Chios, Argos, Athenæ;
Orbis de patria certat, Homere, tua.

We have nothing that is very certain in relation to the particulars of his life. The most regular account is that which goes under the name of Herodotus, and is usually printed with his history: and though it is generally supposed to be a spurious piece, yet as it is ancient, was made use of by Strabo, and exhibits that idea which the later Greeks, and the Romans in the age of Augustus, entertained of Homer, we must content ourselves with giving an abstract of it.

A man of Magnesia, whose name was *Menalippus*, went to settle at Cumæ, where he married the daughter of a citizen called *Homyres*, and had by her a daughter called *Critheis*. The father and mother dying, the young woman was left under the tuition of Cleonax her father's friend, and suffering herself to be deluded, was got with child. The guardian, though his care had not prevented the misfortune, was however willing to conceal it; and therefore sent Critheis to Smyrna, which was then building, 18 years after the founding of Cumæ, and about 168 after the taking of Troy. Critheis being near her time, went one day to a festival which the town of Smyrna was celebrating on the banks of the river Meles; where her pains coming upon her, she was delivered of Homer, whom she called *Melesigenes*, because he was born on the

Homer.

banks of that river. Having nothing to maintain her, ſhe was forced to ſpin, and a man of Smyrna called *Phemius*, who taught literature and muſic, having often ſeen Critheis, who lodged near him, and being pleaſed with her houſewifery, took her into his houſe to ſpin the wool he received from his ſcholars for their ſchooling. Here ſhe behaved herſelf ſo modeſtly and diſcreetly, that Phemius married her; and adopted her ſon, in whom he diſcovered a wonderful genius, and the beſt natural diſpoſition in the world. After the death of Phemius and Critheis, Homer ſucceeded to his father-in-law's fortune and ſchool; and was admired, not only by the inhabitants of Smyrna, but by ſtrangers, who reſorted from all parts to that place of trade. A ſhipmaſter called *Mentes*, who was a man of learning and a lover of poetry, was ſo taken with Homer, that he perſuaded him to leave his ſchool, and to travel with him. Homer, who had then begun his poem of the Iliad, and thought it of great conſequence to ſee the places he ſhould have occaſion to treat of, embraced the opportunity. He embarked with Mentes, and during their ſeveral voyages never failed carefully to note down all that he thought worth obſerving. He travelled into Egypt; from whence he brought into Greece the names of their gods, the chief ceremonies of their worſhip, and a more improved knowledge in the arts than what prevailed in his own country. He viſited Africa and Spain; in his return from whence he touched at Ithaca, where he was much troubled with a rheum falling upon his eyes. Mentes being in haſte to take a turn to Leucadia his native country, left Homer well recommended to Mentor, one of the chief men of the iſland of Ithaca, who took all poſſible care of him. There Homer was informed of many things relating to Ulyſſes, which he afterwards made uſe of in compoſing his Odyſſey. Mentes returning to Ithaca, found Homer cured. They embarked together; and after much time ſpent in viſiting the coaſts of Peloponneſus and the iſlands, they arrived at Colophon, where Homer was again troubled with the defluxion upon his eyes, which proved ſo violent, that he is ſaid to have loſt his ſight. This misfortune made him reſolve to return to Smyrna, where he finiſhed his Iliad. Some time after, the ill poſture of his affairs obliged him to go to Cumæ, where he hoped to have found ſome relief. Here his poems were highly applauded: but when he propoſed to immortalize their town, if they would allow him a ſalary, he was anſwered, that "there would be no end of maintaining all the Ὁμηροι or "blind men;" and hence got the name of *Homer*. He afterwards wandered through ſeveral places, and ſtopped at Chios, where he married, and compoſed his Odyſſey. Some time after, having added many verſes to his poems in praiſe of the cities of Greece, eſpecially of Athens and Argos, he went to Samos, where he ſpent the winter, ſinging at the houſes of the great men, with a train of boys after him. From Samos he went to Io, one of the Sporades, with a deſign to continue his voyage to Athens; but landing by the way at Chios, he fell ſick, died, and was buried on the ſea ſhore.

The only inconteſtable works which Homer has left behind him are the Iliad and Odyſſey. The Batrachomyomachia, or battle of the frogs and mice, has been diſputed. The hymns have been diſputed alſo, and attributed by the ſcholiaſts to Cynæthus the rhapſodiſt: but neither Thucydides, Lucian, nor Pauſanias, have ſcrupled to cite them as genuine. Many other pieces are aſcribed to him: epigrams, the Eartiges, the Cecropes, the deſtruction of Oechalia, of which only the names are remaining.

Homer.

Nothing was ever comparable to the clearneſs and majeſty of Homer's ſtyle; to the ſublimity of his thoughts; to the ſtrength and ſweetneſs of his verſes. All his images are ſtriking; his deſcriptions juſt and exact; the paſſions ſo well expreſſed, and nature ſo juſtly and finely painted, that he gives to every thing motion, life, and action. But he more particularly excels in invention, and in the different characters of his heroes, which are ſo varied, that they affect us in an inexpreſſible manner. In a word, the more he is read by a perſon of good taſte, the more he is admired. Nor are his works to be eſteemed merely as entertaining poems, or as the monuments of a ſublime and varied genius. He was in general ſo accurate with reſpect to coſtume, that he ſeldom mentioned perſons or things that we may not conclude to have been known during the times of which he writes; and it was Mr Pope's opinion, that his account of people, princes, and countries, was purely hiſtorical, founded on the real tranſactions of thoſe times, and by far the moſt valuable piece of hiſtory and geography left us concerning the ſtate of Greece in that early period. His geographical diviſions of that country were thought ſo exact, that we are told of many controverſies concerning the boundaries of Grecian cities which have been decided upon the authority of his poems.

Alcibiades gave a rhetorician a box on the ear for not having Homer's writings in his ſchool. Alexander was raviſhed with them, and commonly placed them under his pillow with his ſword: he incloſed the Iliad in the precious caſket that belonged to Darius; "in order (ſaid he to his courtiers) that the moſt perfect production of the human mind might be incloſed in the moſt valuable caſket in the world." And one day ſeeing the tomb of Achilles in Sigæa, "Fortunate hero! (cried he), thou haſt had a Homer to ſing thy victories!" Lycurgus, Solon, and the kings and princes of Greece, ſet ſuch a value on Homer's works, that they took the utmoſt pains in procuring correct editions of them, the moſt eſteemed of which is that of Ariſtarchus. Didymus was the firſt who wrote notes on Homer; and Euſtathius, archbiſhop of Theſſalonica, in the 12th century, is the moſt celebrated of his commentators. Mr Pope has given an elegant tranſlation of the Iliad, adorned with the harmony of poetic numbers; and Mad. Dacier has tranſlated both the Iliad and Odyſſey in proſe.

Thoſe who deſire to know the ſeveral editions of Homer, and the writers who have employed themſelves on the works of that great poet, may conſult Fabricius, in the firſt volume of his *Bibliotheca Græca*.

A very ſingular diſcovery, however, which was made a few years ago in Ruſſia, deſerves to be here mentioned, together with the circumſtances that attended it. Chriſtian Frederic Matthæi, who had been educated by the learned Erneſti, and did credit to the inſtructions of that celebrated maſter by the great erudition that he diſplayed, being invited to ſettle at Moſcow, and to aſſiſt in a plan of literature for which his abilities and ac-

quiſitions

quiſitions eminently qualified him; on his arrival at that city was informed, equally to his aſtoniſhment and ſatisfaction, that a very copious treaſure of Greek manuſcripts was depoſited in the library of the Holy Synod, which no perſon in that country had either the abilities to make uſe of, or the curioſity to examine. Struck with the relation of a circumſtance ſo unexpected, and at the ſame time ſo peculiarly agreeable to his claſſical taſte, he immediately ſeized the opportunity that was fortunately offered him, to explore this repoſitory of hidden treaſure. After having examined ſeveral curious books, he diſcovered a manuſcript copy of the works of Homer, written about the concluſion of the 14th century, but evidently a tranſcript from a very ancient and moſt valuable copy, which, beſides the Iliad and the Odyſſey, contains alſo 16 of the hymns, which have been long publiſhed under the name of *Homer*. Nor was this all. Twelve lines of a loſt hymn to Bacchus, and the hymn to Ceres, which was alſo loſt, were preſerved in this curious and long unnoticed manuſcript. The hymn to Ceres appears to be entire, excepting a few lines towards the cloſe: and it is ſurely remarkable, that a Greek poem, attributed to Homer, which had been loſt for ages, ſhould be at length diſcovered in Muſcovy, the rudeſt and moſt unclaſſical country in Europe. M. Matthæi, exulting in an acquiſition ſo unexpected, and at the ſame time ſo valuable, communicated it, with ſingular diſintereſtedneſs, to his learned friend M. Ruhnkenius, with whoſe talents and extraordinary erudition he was well acquainted, that this gentleman might preſent it to the world without thoſe delays which would probably have retarded the publication of it at Moſcow. He was rather induced to employ M. Ruhnkenius in the publication of this curious and beautiful remnant of antiquity, becauſe he knew that this gentleman had been particularly engaged in the ſtudy of the hymns of Homer, in order to give the public a complete edition of them. The hymn to Ceres, and the fragment of the hymn to Bacchus, were printed in 1780 at Leyden, under the care of M. Ruhnkenius, who has added ſome very valuable notes and obſervations on the hymn to Ceres, which tend to illuſtrate its beauties, and to throw a light on ſome of its obſcurities. The learned editor obſerves, that nothing was more diſtant from his expectations than the diſcovery of this hymn to Ceres. He knew indeed that a poem bearing that title, and aſcribed to Homer, exiſted in the ſecond century; but as it had long been conſidered as irretrievably loſt, he had formed no hopes of ever ſeeing it reſcued from the obſcurity to which it had been conſigned. He acknowledges, that he has many doubts with reſpect to the high and illuſtrious origin aſcribed to this hymn: but as no poſitive external evidence can be produced to determine the point, he chooſes to reſt his argument on what appears to him the more certain ground of internal proof; and obſerves, that though the poem be exquiſitely beautiful, yet that it is evidently deficient in ſome of Homer's more ſtriking and predominant characteriſtics. It wants his energy and ſpirit; that vigour, that inſpiration, which animate and give an irreſiſtible power, as well as an enchanting beauty, to the poems of that ſublime and inimitable bard. This opinion, as we have already ſeen, hath been given by other critics of all the hymns of Homer. But though M. Ruhnkenius is not inclined to attribute to Homer the hymn to Ceres, he yet acknowledges, that the ſtructure of its language is founded on the model of that great poet, and he heſitates not to give it the honour of very high antiquity. He is of opinion, that it was written immediately after Homer, or at leaſt in the age of Heſiod; and he congratulates the age on the diſcovery of ſo curious a poem, reſcued by mere accident from the darkeſt retreats of oblivion, and perhaps but at a ſlight diſtance from inevitable perdition. He deems it to be an acquiſition, not only calculated to gratify the curioſity of the connoiſſeurs in claſſic antiquity, or to entertain thoſe lovers of Greek poetry whoſe ſtudies are made ſubſervient to a refined and elegant ſpecies of amuſement, but he alſo eſteems it to be of particular uſe to the critic, as it tends to illuſtrate ſome obſcure paſſages both in the Greek and Latin poets.

HOMER, *Omer*, or *Chomer*, a Jewiſh meaſure, containing the tenth part of the epha. See CORUS and MEASURE.

HOMESOKEN. See HAMESECKEN.

HOMICIDE, ſignifies in general the taking away of any perſon's life. It is of three kinds; *juſtifiable*, *excuſable*, and *felonious*. The firſt has no ſhare of guilt at all; the ſecond very little; but the third is the higheſt crime againſt the law of nature that man is capable of committing.

I. Juſtifiable homicide is of divers kinds.

1. Such as is owing to ſome unavoidable *neceſſity*, without any will, intention, or deſire, and without any inadvertence or negligence, in the party killing, and therefore without any ſhadow of blame; as, for inſtance, by virtue of ſuch an office as obliges one, in the execution of public juſtice, to put a malefactor to death, who hath forfeited his life by the laws and verdict of his country. This is an act of neceſſity, and even of civil duty; and therefore not only juſtifiable but commendable, where the law requires it. But the law muſt *require* it, otherwiſe it is not juſtifiable: therefore wantonly to kill the greateſt of malefactors, a felon, or a traitor, attainted or outlawed, deliberately, uncompelled, and extrajudicially, is murder. And farther, if judgment of death be given by a judge not authoriſed by lawful commiſſion, and execution is done accordingly, the judge is guilty of murder. Alſo ſuch judgment, when legal, muſt be executed by the proper officer, or his appointed deputy; for no one elſe is *required* by law to do it, which requiſition it is that juſtifies the homicide. If another perſon doth it of his own head, it is held to be murder: even though it be the judge himſelf. It muſt farther be executed, *ſervato juris ordine;* it muſt purſue the ſentence of the court. If an officer beheads one who is adjudged to be hanged, or *vice verſa*, it is murder: for he is merely miniſterial, and therefore only juſtified when he acts under the authority and compulſion of the law. But if a ſheriff changes one kind of puniſhment for another, he then acts by his own authority, which extends not to the commiſſion of homicide; and beſides, this licence might occaſion a very groſs abuſe of his power. The king indeed may remit part of a ſentence, as in the caſe of treaſon, all but the beheading: but this is no change, no introduction of a new puniſhment; and in the caſe of felony,

Homicide. felony, where the judgment is *to be hanged*, the king (it hath been ſaid) cannot legally order even a peer to be beheaded.

Again: In ſome caſes homicide is juſtifiable, rather by the *permiſſion*, than by the abſolute *command*, of the law: either for the *advancement* of public *juſtice*, which without ſuch indemnification would never be carried on with proper vigour; or, in ſuch inſtances where it is committed for the *prevention* of ſome atrocious *crime*, which cannot otherwiſe be avoided.

2. Homicides, committed for the *advancement* of public *juſtice*, are, 1. Where an officer, in the execution of his office, either in a civil or criminal caſe, kills a perſon that aſſaults and reſiſts him. 2. If an officer, or any private perſon, attempts to take a man charged with felony, and is reſiſted; and, in the endeavour to take him, kills him. 3. In caſe of a riot, or rebellious aſſembly, the officers endeavouring to diſperſe the mob are juſtifiable in killing them, both at common law, and by the riot act, 1 Geo. I. c. 5. 4. Where the priſoners in a gaol, or going to gaol, aſſault the gaoler or officer, and he in his defence kills any of them, it is juſtifiable, for the ſake of preventing an eſcape. 5. If treſpaſſers in foreſts, parks, chaſes, or warrens, will not ſurrender themſelves to the keepers, they may be ſlain; by virtue of the ſtatute 21 Edward I. ſtat. 2. *de malefactoribus in parcis*, and 3 and 4 W. and M. c. 10. But, in all theſe caſes, there muſt be an apparent neceſſity on the officer's ſide; viz. that the party could not be arreſted or apprehended, the riot could not be ſuppreſſed, the priſoners could not be kept in hold, the deer-ſtealers could not but eſcape, unleſs ſuch homicide were committed: otherwiſe, without ſuch abſolute neceſſity, it is not juſtifiable. 6. If the champions in a trial by battle killed either of them the other, ſuch homicide was juſtifiable, and was imputed to the juſt judgment of God, who was thereby preſumed to have decided in favour of the truth.

3. In the next place, ſuch homicide as is committed for the *prevention* of any forcible and atrocious *crime*, is juſtifiable by the law of nature; and alſo by the law of England, as it ſtood ſo early as the time of Bracton, and as it is ſince declared by ſtat. 24 Hen. VIII c. 5. If any perſon attempts a robbery or murder of another, or attempts to break open a houſe in the *night-time* (which extends alſo to an attempt to burn it), and ſhall be killed in ſuch attempt, the ſlayer ſhall be acquitted and diſcharged. This reaches not to any crime unaccompanied with force, as picking of pockets; or to the breaking open of any houſe *in the day time*, unleſs it carries with it an attempt of robbery alſo. So the Jewiſh law, which puniſhed no theft with death, makes homicide only juſtifiable in caſe of *nocturnal* houſe-breaking: "if a thief be found breaking up, and he be ſmitten that he die, no blood ſhall be ſhed for him: but if the ſun be riſen upon him, there ſhall blood be ſhed for him; for he ſhould have made full reſtitution." At Athens, if any theft was committed by night, it was lawful to kill the criminal, if taken in the fact: and, by the Roman law of the twelve tables, a thief might be killed by night with impunity; or even by day, if he armed himſelf with any dangerous weapon: which amounts very nearly to the ſame as is permitted by our own conſtitutions.

Exod. xxii. 2.

The Roman law alſo juſtifies homicide, when committed in defence of the chaſtity either of one's ſelf or relations: and ſo alſo, according to Selden, ſtood the law in the Jewiſh republic. The Engliſh law likewiſe juſtifies a woman killing one who attempts to raviſh her: and ſo too the huſband or father may juſtify killing a man, who attempts a rape upon his wife or daughter; but not if he takes them in adultery by conſent; for the one is forcible and felonious, but not the other. And there is no doubt but the forcibly attempting a crime, of a ſtill more deteſtable nature, may be equally reſiſted by the death of the unnatural aggreſſor. For the one uniform principle that runs through our own, and all other laws, ſeems to be this: That where a crime, in itſelf capital, is endeavoured to be committed by force, it is lawful to repel that force by the death of the party attempting. But, we muſt not carry this doctrine to the ſame viſionary length that Mr Locke does; who holds, "that all manner of force without right upon a man's perſon, puts him in a ſtate of war with the aggreſſor; and, of conſequence, that, being in ſuch a ſtate of war, he may lawfully kill him that puts him under this unnatural reſtraint." However juſt this concluſion may be in a ſtate of uncivilized nature, yet the law of England, like that of every other well-regulated community, is too tender of the public peace, too careful of the lives of the ſubjects, to adopt ſo contentious a ſyſtem; nor will ſuffer with impunity any crime to be *prevented* by death, unleſs the ſame, if committed, would alſo be *puniſhed* by death.

In theſe inſtances of *juſtifiable* homicide, it may be obſerved, that the ſlayer is in no kind of fault whatſoever, not even in the minuteſt degree; and is therefore to be totally acquitted and diſcharged, with commendation rather than blame. But that is not quite the caſe in *excuſable* homicide, the very name whereof imports ſome fault, ſome error, or omiſſion; ſo trivial, however, that the law excuſes it from the guilt of felony, though in ſtrictneſs it judges it deſerving of ſome little degree of puniſhment.

II. Excuſable homicide is of two ſorts; either *per infortunium*, by miſadventure; or *ſe defendendo*, upon a principle of ſelf-preſervation. We will firſt ſee wherein theſe two ſpecies of homicide are diſtinct, and then wherein they agree.

1. Homicide *per infortunium*, or miſadventure, is where a man, doing a lawful act, without any intention of hurt, unfortunately kills another; as where a man is at work with a hatchet, and the head thereof flies off and kills a ſtander-by; or where a perſon, qualified to keep a gun, is ſhooting at a mark, and undeſignedly kills a man: for the act is lawful, and the effect is merely accidental. So where a parent is moderately correcting his child, a maſter his apprentice or ſcholar, or an officer puniſhing a criminal, and happens to occaſion his death, it is only miſadventure; for the act of correction was lawful: but if he exceeds the bounds of moderation, either in the manner, the inſtrument, or the quantity of puniſhment, and death enſues, it is manſlaughter at leaſt, and in ſome caſes (according to the circumſtances) murder; for the act of immoderate correction is unlawful. Thus by an edict of the emperor Conſtantine, when the rigour of the Roman law with regard to ſlaves began to relax and ſoften, a maſter was allowed to chaſtiſe his ſlave with rods and impriſonment,

imprisonment, and if death accidentally ensued, he was guilty of no crime; but if he struck him with a club or a stone, and thereby occasioned his death, or if in any other yet grosser manner *immoderatè suo jure utatur, tunc reus homicidii sit.*

But to proceed. A tilt or tournament, the martial diversion of our ancestors, was however an unlawful act; and so are boxing and sword-playing, the succeeding amusement of their posterity: and therefore, if a knight in the former case, or a gladiator in the latter, be killed, such killing is felony of manslaughter. But if the king command or permit such diversion, it is said to be only misadventure; for then the act is lawful: In like manner as, by the laws both of Athens and Rome, he who killed another in the *pancratium*, or public games, authorised or permitted by the state, was not held to be guilty of homicide. Likewise to whip another's horse, whereby he runs over a child and kills him, is held to be accidental in the rider, for he has done nothing unlawful; but manslaughter in the person who whipped him, for the act was a trespass, and at best a piece of idleness, of inevitably dangerous consequence. And in general, if death ensues in consequence of an idle, dangerous, and unlawful sport, as shooting or casting stones in a town, or the barbarous diversion of cock-throwing; in these and similar cases, the slayer is guilty of manslaughter, and not misadventure only; for these are unlawful acts.

2. Homicide in *self-defence*, or *se defendendo*, upon a sudden affray, is also excusable rather than justifiable, by the English law. This species of self-defence must be distinguished from that just now mentioned, as calculated to hinder the perpetration of a capital crime; which is not only a matter of excuse, but of justification. But the self-defence which we are now speaking of, is that whereby a man may protect himself from an assault, or the like, in the course of a sudden brawl or quarrel, by killing him who assaults him. And this is what the law expresses by the word *chance-medley*, or (as some rather choose to write it) *chaud-medley;* the former of which in its etymology signifies a *casual* affray, the latter an affray in the *heat* of blood or passion: both of them of pretty much the same import; but the former is in common speech too often erroneously applied to any manner of homicide by misadventure; whereas it appears by the statute 24 Hen. VIII. c. 5. and our ancient books, that it is properly applied to such killing as happens in self-defence upon a sudden rencounter. The right of natural defence does not imply a right of attacking: for, instead of attacking one another for injuries past or impending, men need only have recourse to the proper tribunals of justice. They cannot therefore legally exercise this right of preventive defence, but in sudden and violent cases; when certain and immediate suffering would be the consequence of waiting for the assistance of the law. Wherefore, to excuse homicide by the plea of self-defence, it must appear that the slayer had no other possible means of escaping from his assailant.

In some cases this species of homicide (upon *chance-medley* in self-defence) differs but little from manslaughter, which also happens frequently upon *chance-medley* in the proper legal sense of the word. But the true criterion between them seems to be this; when both parties are actually combating at the time when the mortal stroke is given, the slayer is then guilty of manslaughter; but if the slayer hath not begun to fight, or (having begun) endeavours to decline any farther struggle, and afterwards, being closely pressed by his antagonist, kills him to avoid his own destruction, this is homicide excusable by self-defence. For which reason the law requires, that the person, who kills another in his own defence, should have retreated as far as he conveniently or safely can, to avoid the violence of the assault, before he turns upon his assailant; and that not fictitiously, or in order to watch his opportunity, but from a real tenderness of shedding his brother's blood. And though it may be cowardice in time of war between two independent nations, to flee from an enemy; yet between two fellow subjects, the law countenances no such point of honour: because the king and his courts are the *vindices injuriarum*, and will give to the party wronged all the satisfaction he deserves. In this the civil law also agrees with ours, or perhaps goes rather farther; "*qui cum aliter tueri se non possunt, damni culpam dederint, innoxii sunt.*" The party assaulted must therefore flee as far as he conveniently can, either by reason of some wall, ditch, or other impediment; or as far as the fierceness of the assault will permit him; for it may be so fierce as not to permit him to yield a step, without manifest danger of his life, or enormous bodily harm; and then in his defence he may kill his assailant instantly. And this is the doctrine of universal justice, as well as of the municipal law.

And, as the *manner* of the defence, so is also the *time* to be considered: for if the person assaulted does not fall upon the aggressor till the affray is over, or when he is running away, this is revenge, and not defence. Neither, under the colour of self-defence, will the law permit a man to screen himself from the guilt of deliberate murder: for if two persons, A and B, agree to fight a duel, and A gives the first onset, and B retreats as far as he safely can, and then kills A, this is murder; because of the previous malice and concerted design. But if A upon a sudden quarrel assaults B first, and, upon B's returning the assault, A really and *bona fide* flies; and, being driven to the wall, turns again upon B and kills him; this may be *se defendendo*, according to some of our writers; though others have thought this opinion too favourable: inasmuch as the necessity, to which he is at last reduced, originally arose from his own fault. Under this excuse of self-defence, the principal civil and natural relations are comprehended: therefore, master and servant, parent and child, husband and wife, killing an assailant in the necessary defence of each other respectively, are excused; the act of the relation assisting being construed the same as the act of the party himself.

There is one species of homicide *se defendendo*, where the party slain is equally innocent as he who occasions his death: and yet this homicide is also excusable from the great universal principle of self-preservation, which prompts every man to save his own life preferable to that of another, where one of them must inevitably perish. As, among others, in that case mentioned by Lord Bacon, where two persons, being shipwrecked, and getting on the same plank, but finding it not able to save them both, one of them thrusts the other from it, Homicide.

it, whereby he is drowned. He who thus preserves his own life at the expence of another man's; is excusable through unavoidable necessity, and the principle of self-defence; since their both remaining on the same weak plank is a mutual though innocent attempt upon, and an endangering of, each other's life.

Let us next take a view of those circumstances wherein these two species of homicide, by misadventure and self-defence, agree; and these are in their blame and punishment. For the law sets so high a value upon the life of a man, that it always intends some misbehaviour in the person who takes it away, unless by the command or express permission of the law. In the case of misadventure, it presumes negligence, or at least a want of sufficient caution, in him who was so unfortunate as to commit it; who therefore is not altogether faultless. And as to the necessity which excuses a man who kills another *se defendendo*, Lord Bacon intitles it *necessitas culpabilis*, and thereby distinguishes it from the former necessity of killing a thief or a malefactor. For the law intends that the quarrel or assault arose from some unknown wrong, or some provocation, either in word or deed: and since in quarrels both parties may be, and usually are, in some fault; and as it scarce can be tried who was originally in the wrong; the law will not hold the survivor entirely guiltless. But it is clear, in the other case, that where I kill a thief who breaks into my house, the original default can never be upon my side. The law besides may have a farther view, to make the crime of homicide more odious, and to caution men how they venture to kill another upon their own private judgment, by ordaining, that he who slays his neighbour, without an express warrant from the law so to do, shall in no case be absolutely free from guilt.

Nor is the law of England singular in this respect. Even the slaughter of enemies required a solemn purgation among the Jews; which implies, that the death of a man, however it happens, will leave some stain behind it. And the Mosaical law appointed certain cities of refuge for him "who killed his neighbour unawares; as if a man goeth into the wood with his neighbour to hew wood, and his hand fetcheth a stroke with the ax to cut down a tree, and the head slippeth from the helve, and lighteth upon his neighbour that he die, he shall flee into one of those cities and live." But it seems he was not held wholly blameless, any more than in the English law; since the avenger of blood might slay him before he reached his asylum, or if he afterwards stirred out of it till the death of the high priest. In the imperial law likewise casual homicide was excused, by the indulgence of the emperor signed with his own sign manual, *adnotatione principis;* otherwise, the death of a man, however committed, was in some degree punishable. Among the Greeks, homicide by misfortune was expiated by voluntary banishment for a year. In Saxony, a fine is paid to the kindred of the slain; which also, among the western Goths, was little inferior to that of voluntary homicide: and in France, no person is ever absolved in cases of this nature, without a largess to the poor, and the charge of certain masses for the soul of the party killed.

The penalty inflicted by our laws is said by Sir Edward Coke to have been anciently no less than death; which, however, is with reason denied by later and more accurate writers. It seems rather to have consisted in a forfeiture, some say of all the goods and chattels, others of only a part of them, by way of fine or *weregild:* which was probably disposed of, as in France, *in pios usus*, according to the humane superstition of the times, for the benefit of *his* soul who was thus suddenly sent to his account with all his imperfections on his head: But that reason having long ceased, and the penalty (especially if a total forfeiture) growing more severe than was intended, in proportion as personal property has become more considerable, the delinquent has now, and has had as early as our records will reach, a pardon and writ of restitution of his goods as a matter of course and right, only paying for suing out the same. And, indeed, to prevent this expence, in cases where the death has notoriously happened by misadventure or in self-defence, the judges will usually permit (if not direct) a general verdict of acquittal.

III. Felonious homicide is an act of a very different nature from the former, being the killing of a human creature, of any age or sex, without justification or excuse. This may be done either by killing one's self, or another man: for the consideration of which, see the articles *Self-Murder*, Murder, and Manslaughter.

Homily.

HOMILY, in ecclesiastical writers, a sermon or discourse upon some point of religion, delivered in a plain manner, so as to be easily understood by the common people. The word is Greek, ὁμιλια; formed of ὁμιλος, *cœtus*, "assembly or council."

The Greek homily, says M. Fleury, signifies a familiar discourse, like the Latin *sermo;* and discourses delivered in the church took these denominations, to intimate, that they were not harangues or matters of ostentation and flourish, like those of profane orators, but familiar and useful discourses, as of a master to his disciples, or a father to his children.

All the homilies of the Greek and Latin fathers are composed by bishops. We have none of Tertullian, Clemens Alexandrinus, and many other learned persons; because, in the first ages, none but bishops were admitted to preach. The privilege was not ordinarily allowed to priests till toward the fifth century. St Chrysostom was the first presbyter that preached statedly. Origen and St Augustine also preached; but it was by a peculiar licence or privilege.

Photius distinguishes *homily* from *sermon;* in that the homily was performed in a more familiar manner, the prelate interrogating and talking to the people, and they in their turn answering and interrogating him, so that it was properly a conversation; whereas the sermon was delivered with more form, and in the pulpit, after the manner of the orators.

The practice of compiling homilies, which were to be committed to memory, and recited by ignorant or indolent priests, commenced towards the close of the 8th century; when Charlemagne ordered Paul Deacon and Alcuin to form homilies or discourses upon the Gospels and Epistles, from the ancient doctors of the church. This gave rise to that famous collection intitled the *Homilarium of Charlemagne*, and which being followed as a model by many productions of the same kind, composed by private persons, from a principle of

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pious zeal, contributed much (ſays Moſheim) to nouriſh the indolence, and to perpetuate the ignorance of a worthleſs clergy.

There are ſtill extant ſeveral fine homilies, compoſed by the ancient fathers, particularly St Chryſoſtom and St Gregory.

Clementine HOMILIES, in eccleſiaſtical hiſtory, are nineteen homilies in Greek, publiſhed by Cotelerius, with two letters prefixed; one of them written in the name of Peter, the other in the name of Clement, to James biſhop of Jeruſalem; in which laſt letter they are intitled Clement's Epitome of the Preaching and Travels of Peter. According to Le Clerc, theſe homilies were compoſed by an Ebionite in the ſecond century; but Montfaucon ſuppoſes that they were forged long after the age of St Athanaſius. Dr Lardner apprehends, that the Clementine homilies were the original or firſt edition of the Recognitions; and that they are the ſame with the work cenſured by Euſebius under the title of Dialogues of Peter and Appion.

HOMINE REPLEVIANDO, a writ for the bailing of a man out of priſon when he is confined without commandment of the king or his judges, or for any cauſe that is repleviable. But this writ is now ſeldom uſed; a writ of *habeas corpus* being ſued out on the neceſſary occaſions.

HOMMOC, a name given by mariners to a hillock or ſmall eminence of land, reſembling the figure of a cone, and appearing on the ſea coaſt of any country.

HOMO, MAN, is ranked by Linnæus under the order of primates; and characteriſed by having four parallel fore teeth both in the upper and lower jaw, and two mammæ on the breaſt. The ſpecies, according to this author, are two, viz. the homo ſapiens, and the homo troglodytes.

He ſubdivides the homo ſapiens into five varieties, viz. the American, the European, the Aſiatic, the African, and what he calls the *monſtrous*. See MAN.

The troglodytes, or orang-outang, is a native of Ethiopia, Java, and Amboina. His body is white; he walks erect, and is about one-half the ordinary human ſize. He generally lives about 25 years. He conceals himſelf in caves during the day, and ſearches for his prey in the night. He is ſaid to be exceedingly ſagacious, but is not endowed with the faculty of ſpeech. See TROGLODYTES and SIMIA, MAMMALIA *Index*.

HOMOGENEOUS, or HOMOGENEAL (compoſed of the Greek ὁμος, "like," and γενος, "kind"), is a term applied to various ſubjects, to denote, that they conſiſt of ſimilar parts, or of parts of the ſame nature and kind: in contradiſtinction to *heterogeneous*, where the parts are of different natures, &c.

HOMOLOGATION, in the civil law, the act of confirming or rendering a thing more valid and ſolemn, by publication, repetition, or recognition thereof. The word comes from the Greek ὁμολογια, "conſent, aſſent;" formed of ὁμος, *ſimilis*, "like," and λογος, of λεγειν, *dicere*, "to ſay;" q. d. to ſay the ſame thing, to conſent, agree.

HOMOLOGOUS, in *Geometry*, an appellation given to the correſponding ſides and angles of ſimilar figures, as being proportional to each other.

HONAN, a province of China, bounded on the north by that of Petcheli and Chanſi, on the weſt by Chanſi, on the ſouth by Houquang, and on the eaſt by Chantong. Every thing that can contribute to render a country delightful is found united in this province; the Chineſe therefore call it *Tong-hoa*, or *the middle flower*: it is indeed ſituated almoſt in the centre of China. The ancient emperors, invited by the mildneſs of the climate and the beauty of the country, fixed their reſidence here for ſome time. The abundance of its fruits, paſtures, and corn, the effeminacy of its inhabitants (who are accounted extremely voluptuous), and laſtly, the cheapneſs of proviſions, have no doubt prevented trade from being ſo flouriſhing here as in the other provinces of the empire. The whole country is flat excepting towards the weſt, where there ariſes a long chain of mountains, covered with thick foreſts; and the land is in ſuch a high ſtate of cultivation, that thoſe who travel through it imagine they are walking in an immenſe garden.—Beſides the river Hoangho, which traverſes this province, it is watered by a great number of ſprings and fountains; it has alſo a valuable lake, which invites to its banks a prodigious number of women, becauſe its water has the property of communicating a luſtre to ſilk, which cannot be imitated. Excluſive of forts, caſtles, and places of ſtrength, this province contains eight *fou* or cities of the firſt claſs, and 102 of the ſecond and third. In one of theſe cities named *Nanyang*, is found a kind of ſerpent, the ſkin of which is marked with ſmall white ſpots; the Chineſe phyſicians ſteep it in wine, and uſe it afterwards as an excellent remedy againſt the palſy.

HONAN-Fou, a city of the above province, ſituated amidſt mountains and between three rivers. The Chineſe formerly believed this city to be the centre of the earth, becauſe it was in the middle of their empire. Its juriſdiction is very extenſive; for it comprehends one city of the ſecond claſs and thirteen of the third: one of theſe cities named *Teng-fong-hien*, is famous on account of the tower erected by the celebrated Tcheou-kong for an obſervatory; there is ſtill to be ſeen in it an inſtrument which he made uſe of to find the ſhadow at noon, in order to determine the latitude. This aſtronomer lived above a thouſand years before the Chriſtian era, and the Chineſe pretend that he invented the mariners compaſs.

HONDEKOOTER, MELCHIOR, a famous Dutch painter born at Utrecht, excelled in painting animals, and eſpecially birds. His father and grandfather were of the ſame profeſſion, and their ſubjects the ſame. He was trained up to the art by his father; but ſurpaſſed not only him, but even the beſt of his cotemporaries, in a very high degree. Till he was ſeventeen years of age, he continued under the direction of his father, and accuſtomed himſelf to paint ſeveral ſorts of birds; but particularly he was pleaſed to repreſent cocks, hens, ducks, chickens, and peacocks, which he deſcribed in an elegant variety of actions and attitudes. After his father's death, which happened in 1653, he received ſome inſtructions from his uncle John Baptiſt Weeninx; but his principal and beſt inſtructor was nature, which he ſtudied with intenſe application.—His pencil was wonderfully neat and delicate; his touch light; his colouring exceedingly natural, lively, and remarkably tranſparent; and the feathers of his fowls were expreſſed with ſuch a ſwelling ſoftneſs, as might have readily and agreeably deceived the eye of any ſpectator.

spectator. It is reported that he had trained up a cock to stand in any attitude he wanted to describe, and that it was his custom to place that creature near his easel; so that at the motion of his hand the bird would fix itself in the proper posture, and would continue in that particular position without the smallest perceptible alteration for several hours at a time. The landscapes which he introduces as the back grounds of his pictures are adapted with peculiar judgment and skill, and admirably finished; they harmonize with his subject, and always increase the force and the beauty of his principal objects. His touch was very singular, in imitating the natural plumage of the fowls he painted; which not only produced a charming effect, but also may prove serviceable to an intelligent observer, to assist him in determining which are the genuine works of this master, and which are impositions. His pictures sell at a high price, and are much sought after. He died at Utrecht in 1695, aged 59.

HONDURAS, a province of North America in New Spain, lying on the North Sea, being about 370 miles in length, and 200 in breadth; it was discovered by Christopher Columbus in the year 1501. The English have been possessed of the logwood country on the bay of Honduras a great while, and cut large quantities every year. The Mosquito native Americans live in the eastern parts; and being independent of the Spaniards, have entered into treaties with the English, and serve them in several capacities. This province is watered by several rivers, which enrich the country by their inundations; and it is very fertile in Indian corn. It is said there are some mines of gold and silver in this province. Valladolid is the capital town.

HONE, a fine kind of white stone, used for setting razors, pen knives, and the like.

HONEY, a sweet vegetable juice, collected by the bees from the flowers of various plants, and deposited in the cells of the comb; from which it is extracted either by spontaneous percolation through a sieve in a warm place, the comb being separated and laid thereon, or by expression. That which runs spontaneously is purer than that which is expressed, a quantity of the wax and other matters being forced out along with it by the pressure. The best sort of honey is of a thick consistence, a whitish colour inclining to yellow, an agreeable smell, and pleasant taste: both the colour and flavour are said to differ in some degree, according to the plants which the bees collect it from. It is supposed that honey is merely the juice of the flower perspiring, and becoming inspissated thereon, and that the bee takes it up with its proboscis, and carries it to be deposited in its waxen cells, with which the young bees are to be fed in summer, and the old ones in winter; but it is certain, that honey can be procured by no other method of collecting this juice than by the bees. The honey wrought by the young bees, and that which is permitted to run from the comb without heat or pressure, is white and pure, and called *virgin honey*. The honey of old bees, and that which is forced from the comb by heat or pressure, is yellow, from the wax. Honey produced where the air is clear and hot, is better than that where the air is variable and cold.—The honey of Narbonne in France, where rosemary abounds, is said to have a very manifest flavour of that plant, and to be imitable by adding to other honey an infusion of rosemary flowers.

Honey, considered as a medicine, is a very useful detergent and aperient, powerfully dissolving viscid juices, and promoting the expectoration of tough phlegm. In some particular constitutions it has an inconvenience of griping, or of proving purgative, which is said to be in some measure prevented by previously boiling the honey. This, however, with all constitutions, is by no means effectual; and the circumstance mentioned has had so much weight with the Edinburgh college, that they do not now employ it in any preparation, and have entirely rejected the mella medicata, substituting syrups in their place: but there can be no doubt that honey is very useful in giving form to different articles, although there be some individuals with whom it may disagree. In order, however, to obtain the good effects of the honey itself, it must be used to a considerable extent, and as an article of diet. The following remarkable instances of the good effects of honey in some asthmatic cases, given by Mr Monro in his Medical and Pharmaceutical Chemistry, deserve to be here inserted. "The late Dr John Hume, one of the commissioners of the sick and hurt of the royal navy, was for many years violently afflicted with the asthma. Having taken many medicines without receiving relief, he at last resolved to try the effects of honey, having long had a great opinion of its virtues as a pectoral. For two or three years he ate some ounces of it daily, and got entirely free of his asthma, and likewise of a gravelly complaint with which he had long been afflicted. About two years after he had recovered his health, when he was sitting one day in the office for the sick and hurt, a person labouring under a great difficulty of breathing, who looked as if he could not live many days, came to him, and asked him by what means he had been cured of his asthma? Dr Hume told him the particulars of his own case, and mentioned to him the means by which he had found relief. For two years after he heard nothing of this person, who was a stranger to him, and had seemed so bad that he did not imagine he could have lived many days, and therefore had not even asked him who he was; but at the end of that period, a man seemingly in good health, and decently dressed, came to the sick and hurt office, and returned him thanks for his cure, which he assured him had been entirely brought about by the free use of honey."

Honey-Dew, a sweet saccharine substance found on the leaves of certain trees, of which bees are very fond, by the husbandmen supposed to fall from the heavens like common dew. This opinion hath been refuted, and the true origin of this and other saccharine dews shown by the Abbé Boissier de Sauvages, in a memoir read before the Society of Sciences at Montpelier. "Chance (says the abbé) afforded me an opportunity of seeing this juice in its primitive form on the leaves of the holm oak: these leaves were covered with thousands of small round globules or drops, which, without touching one another, seemed to point out the pore from whence each of them had proceeded. My taste informed me, that they were as sweet as honey; the honey-dew on a neighbouring bramble did not resemble the former, the drops having run to-

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Honey-Dew.

gether, owing either to the moiſture of the air which had diluted them, or to the heat which had expanded them. The dew was become more viſcous, and lay in large drops, covering the leaves; in this form it is uſually ſeen.

"The oak had at this time two ſorts of leaves: the old, which were ſtrong and firm; and the new, which were tender, and newly come forth. The honey-dew was found only on the old leaves, though theſe were covered by the new ones, and by that means ſheltered from any moiſture that could fall from above. I obſerved the ſame on the old leaves of the bramble, while the new leaves were quite free from it. Another proof that this dew proceeds from the leaves is, that other neighbouring trees not furniſhed with a juice of this kind had no moiſture on them; and particularly the mulberry, which is a very particular circumſtance, for this juice is a deadly poiſon to ſilk-worms. If this juice fell in the form of a dew, miſt, or fog, it would wet all the leaves without diſtinction, and every part of the leaves, under as well as upper. Heat may have ſome ſhare in its production: for though the common heat promotes only the tranſpiration of the more volatile and fluid juices, a ſultry heat, eſpecially if reflected by clouds, may ſo far dilate the veſſel as to produce a more viſcous juice, ſuch as the honey-dew.

"The ſecond kind of honey-dew, which is the chief reſource of bees after the ſpring flowers and dew by tranſpiration on leaves are paſt, owes its origin to a ſmall inſect called a *vine-fretter;* the excrement ejected with ſome force by this inſect makes a part of the moſt delicate honey known in nature (ſee Aphis). Theſe vine-fretters reſt during ſeveral months on the barks of particular trees, and extract their food by piercing that bark, without hurting or deforming the tree. Theſe inſects alſo cauſe the leaves of ſome trees to curl up, and produce galls upon others. They ſettle on branches that are a year old. The juice, at firſt perhaps hard and crabbed, becomes, in the bowels of this inſect, equal in ſweetneſs to the honey obtained from the flowers and leaves of vegetables; excepting that the flowers may communicate ſome of their eſſential oil to the honey, and this may give it a peculiar flavour, as happened to myſelf by planting a hedge of roſemary near my bees at Sauvages: the honey has taſted of it ever ſince, that ſhrub continuing long in flower.

"I have obſerved two ſpecies of vine-fretters, which live unſheltered on the bark of young branches; a larger and a leſſer. The leſſer ſpecies is of the colour of the bark upon which it feeds, generally green. It is chiefly diſtinguiſhed by two horns, or ſtraight, immoveable, fleſhy ſubſtances, which riſe perpendicularly from the lower ſides of the belly, one on each ſide. This is the ſpecies which lives on the young branches of bramble and elder. The larger ſpecies is double the ſize of the other; is of a blackiſh colour; and inſtead of the horns which diſtinguiſh the other, have in the ſame part of the ſkin a ſmall button, black and ſhining like jet.

"The buzzing of bees in a tuft of holm-oak, made me ſuſpect that ſomething very intereſting brought ſo many of them thither. I knew that it was not the ſeaſon for expecting honey-dew, nor was it the place where it is uſually found; and was ſurpriſed to find the tuft of leaves and branches covered with drops which the bees collected with a humming noiſe. The form of the drops drew my attention, and led me to the following diſcovery. Inſtead of being round like drops which had fallen, each formed a ſmall longiſh oval. I ſoon perceived from whence they proceeded. The leaves covered with theſe drops of honey were ſituated beneath a ſwarm of the larger black vine-fretters; and on obſerving theſe inſects, I perceived them from time to time raiſe their bellies, at the extremity of which there then appeared a ſmall drop of an amber colour, which they inſtantly ejected from them to the diſtance of ſome inches. I found by taſting ſome of theſe drops which I had catched on my hand that it had the ſame flavour with what had before fallen on the leaves. I afterwards ſaw the ſmaller ſpecies of vine-fretters eject their drops in the ſame manner. This ejection is ſo far from being a matter of indifference to theſe inſects themſelves, that it ſeems to have been wiſely inſtituted to procure cleanlineſs in each individual, as well as to preſerve the whole ſwarm from deſtruction; for preſſing as they do one upon another, they would otherwiſe ſoon be glued together, and rendered incapable of ſtirring. The drops thus ſpurted out fall upon the ground, if not intercepted by leaves or branches; and the ſpots they make on ſtones remain ſome time, unleſs waſhed off by rain. This is the only honey-dew that falls; and this never falls from a greater height than a branch where theſe inſects can cluſter.

"It is now eaſy to account for a phenomenon which formerly puzzled me greatly. Walking under a lime-tree in the king's garden at Paris, I felt my hand wetted with little drops, which I at firſt took for ſmall rain. The tree indeed ſhould have ſheltered me from the rain, but I eſcaped it by going from under the tree. A ſeat placed near the tree ſhone with theſe drops. And being then unacquainted with any thing of this kind, except the honey-dew found on the leaves of ſome particular trees, I was at a loſs to conceive how ſo glutinous a ſubſtance could fall from the leaves in ſuch ſmall drops: for I knew that rain could not overcome its natural attraction to the leaves till it became pretty large drops; but I have ſince found, that the lime-tree is very ſubject to theſe vine-fretters.

"Bees are not the only inſects that feaſt upon this honey; ants are equally fond of it. Led into this opinion by what naturaliſts have ſaid, I at firſt believed that the horns in the leſſer ſpecies of theſe vine-fretters had in their extremity a liquor which the ants went in ſearch of: but I ſoon diſcovered that what drew the ants after them came from elſewhere, both in the larger and leſſer ſpecies, and that no liquor is diſcharged by the horns. There are two ſpecies of ants which ſearch for theſe inſects. The large black ants follow thoſe which live on the oaks and cheſnut; the leſſer ants attend thoſe on the elder. But as the ants are not, like the bees, provided with the means of ſucking up fluids; they place themſelves near the vine-fretters, in order to ſeize the drop the moment they ſee it appear upon the anus; and as the drop remains ſome time on the ſmall vine-fretters before they can caſt it off, the ants have leiſure to catch it, and thereby prevent the bees from having any ſhare: but the

the vine-fretters of the oak and chesnut being ſtronger, and perhaps more plentifully ſupplied with juice, dart the drop inſtantly, ſo that the larger ants get very little of it.

"The vine-fretters finding the greateſt plenty of juice in trees about the middle of ſummer, afford alſo at that time the greateſt quantity of honey; and this leſſens as the ſeaſon advances, ſo that in the autumn the bees prefer to it the flowers then in ſeaſon. Though theſe inſects pierce the tree to the ſap in a thouſand places, yet the trees do not ſeem to ſuffer at all from them, nor do the leaves loſe the leaſt of their verdure. The huſbandman therefore acts injudiciouſly when he deſtroys them."

Honey-Guide, a curious ſpecies of cuckow. See CUCULUS, ORNITHOLOGY *Index*.

Honey-Locuſt, or *Three-thorned Acacia*. See GLEDITSIA, BOTANY *Index*.

Honey-Suckle. See LONICERA, BOTANY *Index*.

HONFLEUR, a conſiderable ſea-port town of France, in the department of Calvados, with a good harbour, and trade in bone-lace. It is ſeated on the river Seine, in E. Long. 0. 8. N. Lat. 17. 49.

HONI SOIT QUI MAL Y PENSE, q. d. "Evil to him that thinks evil;" the motto of the moſt noble order of the knights of the Garter. See GARTER.

HONITON, a very pleaſant market and borough town in Devonſhire, ſituated 156 miles weſt of London, and 16 eaſt of Exeter. It conſiſts of about 400 houſes; and has one church on a hill full half a mile from the town, and a chapel and free grammar ſchool in the town. It is well paved and lighted, and lakes of water run through it. This place has ſuffered by fires greatly in 1747 and 1765. The market is on Saturday, and one fair in July; its manufactures are ſerge, and rich bone-lace and edgings. It was a corporation chartered by James II. but reverted to its old conſtitution on the revolution, and is now governed by a portreeve who is choſen annually. It firſt returned members the 28th Edw. I.

HONORIACI, in antiquity, an order of ſoldiery under the eaſtern empire, who introduced the Goths, Vandals, Alani, Suevi, &c. into Spain. Didymus and Verinianus, two brothers, had, with great vigilance and valour, defended the paſſages of the Pyreneans againſt the Barbarians for ſome time, at their own expence; but being at length killed, the emperor Conſtantius appointed the *honoriaci* to defend thoſe paſſages, who, not contented to lay them open to all the nations of the north then ravaging the Gauls, joined themſelves to them.

HONOUR, a teſtimony of eſteem or ſubmiſſion, expreſſed by words, actions, and an exterior behaviour, by which we make known the veneration and reſpect we entertain for any one on account of his dignity or merit. The word *honour* is alſo uſed in general for the eſteem due to virtue, glory, and reputation. It is alſo uſed for *virtue* and *probity* themſelves, and for an exactneſs in performing whatever we have promiſed; and in this laſt ſenſe we uſe the term, *a man of honour*. But *honour* is more particularly applied to two different kinds of virtue; bravery in men, and chaſtity in women.—Virtue and Honour were deified among the ancient Greeks and Romans, and had a joint temple conſecrated to them at Rome; but afterwards each of them had ſeparate temples, which were ſo placed, that no one could enter the temple of Honour without paſſing through that of Virtue; by which the Romans were continually put in mind, that virtue is the only direct path to true glory. Plutarch tells us, that the Romans, contrary to their uſual cuſtom, ſacrificed to Honour uncovered: perhaps to denote, that wherever honour is, it wants no covering, but ſhows itſelf openly to the world.

The Spaniſh hiſtorians relate a memorable inſtance of honour and regard to truth. A Spaniſh cavalier in a ſudden quarrel ſlew a Mooriſh gentleman, and fled. His purſuers ſoon loſt ſight of him, for he had unperceived thrown himſelf over a garden wall. The owner, a Moor, happening to be in his garden, was addreſſed by the Spaniard on his knees, who acquainted him with his caſe, and implored concealment. "Eat this," ſaid the Moor (giving him half a peach), "you now know that you may confide in my protection." He then locked him up in his garden apartment, telling him as ſoon as it was night he would provide for his eſcape to a place of greater ſafety. The Moor then went into his houſe, where he had but juſt ſeated himſelf, when a great crowd, with loud lamentations, came to his gate, bringing the corpſe of his ſon, who had juſt been killed by a Spaniard. When the firſt ſhock of ſurpriſe was a little over, he learnt from the deſcription given, that the fatal deed was done by the very perſon then in his power. He mentioned this to no one; but as ſoon as it was dark retired to his garden, as if to grieve alone, giving orders that none ſhould follow him. Then accoſting the Spaniard, he ſaid, "Chriſtian, the perſon you have killed is my ſon; his body is now in my houſe. You ought to ſuffer; but you have eaten with me, and I have given you my faith, which muſt not be broken." He then led the aſtoniſhed Spaniard to his ſtables, mounted him on one of his fleeteſt horſes, and ſaid, "Fly far while the night can cover you; you will be ſafe in the morning. You are indeed guilty of my ſon's blood: but God is juſt and good; and I thank him I am innocent of yours, and that my faith given is preſerved."

This point of honour is moſt religiouſly obſerved by the Arabs and Saracens, from whom it was adopted by the Moors of Africa, and by them was brought into Spain. The following inſtance of Spaniſh honour may ſtill dwell in the memory of many living, and deſerves to be handed down to the lateſt poſterity. In the year 1746, when we were in hot war with Spain, the Elizabeth of London, Captain William Edwards, coming through the gulf from Jamaica, richly laden, met with a moſt violent ſtorm, in which the ſhip ſprung a leak, that obliged them, for the ſaving of their lives, to run into the Havannah, a Spaniſh port. The captain went on ſhore, and directly waited on the governor, told the occaſion of his putting in, and that he ſurrendered the ſhip as a prize, and himſelf and his men as priſoners of war, only requeſting good quarter. "No, Sir, replied the Spaniſh governor, "if we had taken you in fair war at ſea, or approaching our coaſt with hoſtile intentions, your ſhip would then have been a prize, and your people priſoners; but when, diſtreſſed by a tempeſt, you come into our ports for the ſafety of your lives, we, the enemies, being men, are bound as ſuch by the laws of humanity to afford relief

Honour.

relief to diſtreſſed men who aſk it of us. We cannot even againſt our enemies take advantage of an act of God. You have leave therefore to unload your ſhip, if that be neceſſary, to ſtop the leak; you may refit her here, and traffic ſo far as ſhall be neceſſary to pay the charges; you may then depart, and I will give you a paſs to be in force till you are beyond Bermuda: if after that you are taken, you will then be a lawful prize; but now you are only a ſtranger, and have a ſtranger's right to ſafety and protection." The ſhip accordingly departed, and arrived ſafe in London.

A remarkable inſtance of the like honour is recorded of a poor unenlightened African negro, in Captain Snelgrave's account of his voyage to Guinea. A New England ſloop, trading there in 1752, left a ſecond mate, William Murray, ſick on ſhore, and ſailed without him. Murray was at the houſe of a black named Cudjoe, with whom he had contracted an acquaintance during their trade. He recovered; and the ſloop being gone, he continued with his black friend till ſome other opportunity ſhould offer of his getting home. In the mean time a Dutch ſhip came into the road, and ſome of the blacks coming on board her, were treacherouſly ſeized and carried off as their ſlaves. The relations and friends, tranſported with ſudden rage, ran into the houſe of Cudjoe, to take revenge by killing Murray. Cudjoe ſtopt them at the door, and demanded what they wanted. "The white men," ſaid they, "have carried away our brothers and ſons, and we will kill all white men. Give us the white man you have in your houſe, for we will kill him." "Nay," ſaid Cudjoe, "the white men that carried away your relations are bad men, kill them when you can take them; but this white man is a good man, and you muſt not kill him."—"But he is a white man," they cried; "and the white men are all bad men, we will kill them all." "Nay," ſays he, "you muſt not kill a man that has done no harm, only for being white. This man is my friend, my houſe is his poſt, I am his ſoldier, and muſt fight for him; you muſt kill me before you can kill him. What good man will ever come again under my roof, if I let my floor be ſtained with a good man's blood?" The negroes ſeeing his reſolution, and being convinced by his diſcourſe that they were wrong, went away aſhamed. In a few days Murray ventured abroad again with his friend Cudjoe, when ſeveral of them took him by the hand, and told him, "They were glad they had not killed him; for as he was a good (meaning innocent) man, their God would have been very angry, and would have ſpoiled their fiſhing."

Honour, in the *beau monde*, has a meaning materially different from the above, and which it is eaſier to illuſtrate than define. It is, however, ſubject to a ſyſtem of rules, called the *law of honour*, conſtructed by people of faſhion, calculated to facilitate their intercourſe with one another, and for no other purpoſe. Conſequently, nothing is conſidered as inconſiſtent with honour, but what tends to incommode this intercourſe. Hence, as Archdeacon Paley ſtates the matter, profaneneſs, neglect of public worſhip or private devotion, cruelty to ſervants, rigorous treatment of tenants or other dependents, want of charity to the poor, injuries done to tradeſmen by inſolvency or delay of payment, with numberleſs examples of the ſame kind, are accounted no breaches of honour; becauſe a man is not a leſs agreeable companion for theſe vices, nor the worſe to deal with in thoſe concerns which are uſually tranſacted between one gentleman and another. —Again, the *law of honour* being conſtituted by men occupied in the purſuit of pleaſure, and for the mutual conveniency of ſuch men, will be found, as might be expected from the character and deſign of the law-makers, to be, in moſt inſtances, favourable to the licentious indulgence of the natural paſſions. Thus it allows of fornication, adultery, drunkenneſs, prodigality, duelling, and revenge in the extreme; and lays no ſtreſs upon the virtues oppoſite to theſe.

Honour or *Rank*.—The degrees of honour which are obſerved in Britain may be comprehended under theſe two heads, viz. *nobiles majores*, and *nobiles minores*. Thoſe included under the firſt rank are, archbiſhops, dukes, marquiſes, earls, viſcounts, biſhops, and barons; which are all diſtinguiſhed by the reſpective ornaments of their eſcutcheons: and thoſe of the laſt are baronets, knights, eſquires, and gentlemen. There are ſome authors who will have baronets to be the laſt under the firſt rank; and their reaſon is, becauſe their honour is hereditary, and by patent, as that of the nobility. See Commonalty and Nobility.

Honours of War, in a ſiege, is, when a governor, having made a long and vigorous defence, is at laſt obliged to ſurrender the place to the enemy for want of men and proviſions, and makes it one of his principal articles to march out with the *honours of war*; that is, with ſhouldered arms, drums beating, colours flying, and all their baggage, &c.

Military Honours. All armies ſalute crowned heads in the moſt reſpectful manner, drums beating a march, colours and ſtandards dropping, and officers ſaluting. Their guards pay no compliment, except to the princes of the blood; and even that by courteſy, in the abſence of the crowned head.

To the commander in chief the whole line turns out without arms, and the camp-guards beat a march, and ſalute. To generals of horſe and foot, they beat a march, and ſalute. Lieutenant-generals of ditto, three ruffs, and ſalute. Major-generals of ditto, two ruffs, and ſalute. Brigadiers of ditto, reſted arms, one ruff, and ſalute. Colonels of ditto, reſted arms, and no beating. Centinels reſt their arms to all field-officers, and ſhoulder to every officer. All governors, that are not general officers, ſhall, in all places where they are governors, have one ruff, with reſted arms; but for thoſe who have no commiſſion as governors, no drum ſhall beat. Lieutenant-governors ſhall have the main-guard turned out to them with ſhouldered arms.

Pruſſian Honours of War, chiefly imitated by moſt powers in Europe, are,

To the king, all guards beat the march, and all officers ſalute. Field-marſhals received with the march, and ſaluted in the king's abſence. General of horſe or foot, four ruffs; but if he commands in chief, a march and ſalute. Lieutenant-generals of horſe or foot, commanding or not, guards beat three ruffs. Major-generals of horſe and foot, two ruffs. Officers, when their guards are under arms, and a general makes a ſignal, muſt reſt to him, but not beat; when not got under arms, and a ſignal made, only ſtand by their arms.

Village-

Village-guards go under arms only to the king, field-marſhals, generals of horſe and foot, and to the general of the day. Generals guards go under arms only to the king, field-marſhals, and the general over whom they mount. Commanding officers of regiments and battalions, their own quarter and rear guards to turn out; but not to other field-officers, unleſs they are of the day. Generals in foreign ſervice, the ſame.

Honours paid by Centinels. Field-marſhals; two centinels with ordered fire-locks, at their tent or quarters. Generals of horſe or foot; two centinels, one with his firelock ſhouldered, the other ordered. Lieutenant-generals; one, with firelock ordered. Major-generals; one, with firelock ſhouldered.

The firſt battalion of guards go under arms to the king only; not to ſtand by, nor draw up in the rear of their arms to any other; nor to give centinels to foreigners. Second and third battalions draw up behind their arms to the princes, and to field-marſhals; but when on grenadier guards or out-poſts, they turn out, as other guards do, to the officers of the day. They give one centinel with ſhouldered arms to the princes of the blood, and to field-marſhals when they lie alone in garriſons.

Court of Honour. See *Court of Chivalry.*

Fountain of Honour. The king is ſo ſtyled, as being the ſource of honours, dignities, &c. See Prerogative.

It is impoſſible that government can be maintained without a due ſubordination of rank; that the people may know and diſtinguiſh ſuch as are ſet over them, in order to yield them their due reſpect and obedience; and alſo that the officers themſelves, being encouraged by emulation and the hopes of ſuperiority, may the better diſcharge their functions: and the law ſuppoſes, that no one can be ſo good a judge of their ſeveral merits and ſervices as the king himſelf who employs them. It has therefore entruſted him with the ſole power of conferring dignities and honours, in confidence that he will beſtow them upon none but ſuch as deſerve them. And therefore all degrees of nobility, of knighthood, and other titles, are received by immediate grant from the crown; either expreſſed in writing, by writs or letters patent, as in the creation of peers and baronets; or by corporeal inveſtiture, as in the creation of a ſimple knight.

From the ſame principle alſo ariſes the prerogative of erecting and diſpoſing of offices: for honours and offices are in their nature convertible and ſynonymous. All offices under the crown carry in the eye of the law an honour along with them; becauſe they imply a ſuperiority of parts and abilities, being ſuppoſed to be always filled with thoſe that are moſt able to execute them. And, on the other hand, all honours in their original had duties or offices annexed to them: an earl, *comes*, was the conſervator or governor of a county; and a knight, *miles*, was bound to attend the king in his wars. For the ſame reaſon therefore that honours are in the diſpoſal of the king, offices ought to be ſo likewiſe; and as the king may create new titles, ſo may he create new offices; but with this reſtriction, that he cannot create new offices with new fees annexed to them, nor annex new fees to old offices; for this would be a tax upon the ſubject, which cannot be impoſed but by act of parliament. Wherefore, in 13 Hen. IV. a new office being created by the king's letters patent for meaſuring cloths, with a new fee for the ſame, the letters patent were, on account of the new fee, revoked and declared void in parliament.

Upon the ſame or a like reaſon, the king has alſo the prerogative of conferring privileges upon private perſons. Such as granting place or precedence to any of his ſubjects, as ſhall ſeem good to his royal wiſdom: or ſuch as converting aliens, or perſons born out of the king's dominions, into denizens; whereby ſome very conſiderable privileges of natural-born ſubjects are conferred upon them. Such alſo is the prerogative of erecting corporations; whereby a number of private perſons are united and knit together, and enjoy many liberties, powers, and immunities in their political capacity, which they were utterly incapable of in their natural.

Maids of Honour, are young ladies in the queen's houſehold, whoſe office is to attend the queen when ſhe goes abroad, &c. In England they are ſix in number, and their ſalary 300l. per annum each.

Honour is particularly applied in our cuſtoms to the more noble kind of ſeignories or lordſhips, whereof other inferior lordſhips or manors hold or depend. As a manor conſiſts of ſeveral tenements, ſervices, cuſtoms, &c. ſo an honour contains divers manors, knights-fees, &c. It was alſo formerly called *beneficium* or *royal fee*, being always held of the king *in capite.*

Honour Point, in *Heraldry*, is that next above the centre of the eſcutcheon, dividing the upper part into two equal portions.

Honourable, a title conferred on the younger ſons of earls, the ſons of viſcounts and barons; as alſo on ſuch perſons as have the king's commiſſion, and upon thoſe who enjoy places of truſt and honour.

HONOURARY, ſomething done or conferred upon any one, to do him honour. See the article Honour.

Honourary is ſometimes underſtood of a perſon who bears or poſſeſſes ſome poſt or title, only for the name's ſake, without doing any thing of the functions belonging to it, or receiving any advantage from it: thus we ſay honourary counſellors, honourary fellows, &c.

Honourary is alſo uſed for a lawyer's fee, or a ſalary given to public profeſſors in any art or ſcience.

HOOD, Robin, a famous outlaw and deer-ſtealer, who chiefly harboured in Sherwood foreſt in Nottinghamſhire. He was a man of family, which by his pedigree appears to have had ſome title to the earldom of Huntingdon; and played his pranks about the latter end of the 12th century. He was famous for archery and for his treatment of all travellers who came in his way: levying contributions on the rich, and relieving the poor. Falling ſick at laſt, and requiring to be blooded, he is ſaid to have been betrayed and bled to death. He died in 1247; and was buried at Kirklees in Yorkſhire, then a Benedictine monaſtery, where his graveſtone is ſtill ſhown.

Hood. See Chaperon and Cowl.

Hood, in falconry, is a piece of leather, wherewith the head of a hawk, falcon, or the like, is covered.

Hood Iſland, one of the *Marquesas Iſlands*, in the South

South sea. It was discovered in April 1774 by Captain Cook, who gave it that name from the person who first saw the land. It is the most northerly of the cluster, and lies in S. Lat. 9. 26. W. Long. 139. 13.

HOOF, the horny substance that covers the feet of divers animals, as oxen, horses, &c.

Hoof-bound. See FARRIERY *Index.*

HOOGUESTRATTEN, a town of the Netherlands, in Dutch Brabant, and capital of a county of the same name. E. Long. 4. 4. N. Lat. 51. 25.

HOOK, in angling, &c. See *Fishing-hook.*

Hooks, in building, &c. are of various sorts; some of iron and others of brass, viz. 1. Armour-hooks, which are generally of brass, and are to lay up arms upon, as guns, muskets, half-pikes, pikes, javelins, &c. 2. Casement-hooks. 3. Chimney-hooks, which are made both of brass and iron, and of different fashions: their use is to set the tongs and fire-shovel against. 4. Curtain-hooks. 5. Hooks for doors, gates, &c. 6. Double line-hooks, large and small. 7. Single line-hooks, large and small. 8. Tenter-hooks of various sorts. See TENTER.

Hooks of a ship, are all those forked timbers which are placed directly upon the keel, as well in her run as in her rake.

Can-Hooks, those which being made fast to the end of a rope with a noose (like that which brewers use to sling or carry their barrels on), are made use of for slings.

Foot-Hooks, in a ship, the same with futtocks.

Loof-Hooks, a tackle with two hooks; one to hitch into a cringle of the main or fore-sail, in the bolt-rope at the leech of the sail by the clew; and the other is to hitch into a strap, which is spliced to the chess-tree.

Their use is to pull down the sail, and succour the tackles in a large sail and stiff gale, that all the stress may not bear upon the tack. It is also used when the tack is to be seized more secure, and to take off or put on a bonnet or drabler.

Hook-Pins, in architecture, are taper iron pins, only with a hook-head, to pin the frame of a roof or floor together.

HOOKAH, among the Arabs and other nations of the East, is a pipe of a singular and complicated construction, through which tobacco is smoked: out of a small vessel of a globular form, and nearly full of water, issue two tubes, one perpendicularly, on which is placed the tobacco; the other obliquely from the side of the vessel, and to that the person who smokes applies his mouth; the smoke by this means being drawn through water, is cooled in its passage and rendered more grateful: one takes a whiff, draws up a large quantity of smoke, puffs it out of his nose and mouth in an immense cloud, and passes the hookah to his neighbour; and thus it goes round the whole circle.—The hookah is known and used throughout the east; but in those parts of it where the refinements of life prevail greatly, every one has his hookah sacred to himself; and it is frequently an implement of a very costly nature, being of silver, and set with precious stones; in the better kind, that tube which is applied to the mouth is very long and pliant; and for that reason is termed the snake: people who use it in a luxurious manner, fill the vessel through which the smoke is drawn with rose water, and it thereby receives some of the fragrant quality of that fluid.

HOOKE, Robert, a very eminent English mathematician and philosopher, was the son of Mr John Hooke minister of Freshwater, in the isle of Wight, where he was born in 1635. He very early discovered a genius for mechanics, by making curious toys with great art and dexterity. He was educated under Dr Bushby in Westminster school; where he not only acquired a competent share of Greek and Latin, together with an insight into Hebrew and some other Oriental languages, but also made himself master of a considerable part of Euclid's elements. About the year 1653 he went to Christ-church in Oxford, and in 1655 was introduced to the Philosophical Society there; where, discovering his mechanical genius, he was first employed to assist Dr Willis in his operations in chemistry, and afterwards recommended to the honourable Robert Boyle, whom he served several years in the same capacity. He was also instructed in astronomy about this time by Dr Seth Ward, Savilian professor of that science; and from henceforward distinguished himself by many noble inventions and improvements of the mechanic kind. He invented several astronomical instruments, for making observations both at sea and land; and was particularly serviceable to Mr Boyle in completing the invention of the air-pump. Sir John Cutler having founded a mechanic school in 1664, he settled an annual stipend on Mr Hooke for life, intrusting the president, council, and fellows, of the Royal Society to direct him with respect to the number and subjects of his lectures; and on the 11th of January 1664-5, he was elected by that society curator of experiments for life, with an additional salary. In 1666 he produced to the Royal Society a model for rebuilding the city of London destroyed by fire, with which the society was well pleased; but although the lord mayor and aldermen preferred it to that of the city surveyor, it was not carried into execution. It is said, by one part of this model of Mr Hooke's, it was designed to have all the chief streets, as from Leaden-hall to Newgate, and the like, to lie in exact straight lines, and all the other cross streets turning out of them at right angles, with all the churches, public buildings, markets, &c. in proper and convenient places. The rebuilding of the city according to the act of parliament requiring an able person to set out the ground to the proprietors, Mr Hooke was appointed one of the surveyors; in which employment he got most part of his estate, as appeared pretty evident from a large iron chest of money found after his death, locked down with a key in it, and a date of the time, which showed it to have been so shut up above 30 years.—Mr Oldenburgh, secretary to the Royal Society, dying in 1677, Mr Hooke was appointed to supply his place, and began to take minutes at the meeting in October, but did not publish the Transactions. In the beginning of the year 1687, his brother's daughter, Mrs Grace Hooke, who had lived with him several years, died; and he was so affected with grief at her death, that he hardly ever recovered it, but was observed from that time to become less active, more melancholy, and even more cynical than ever.

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ever. At the fame time, a chancery fuit in which he was concerned with Sir John Cutler, on account of his falary for reading the Cutlerian lectures, made him very uneafy, and increafed his diforder. In 1691, he was employed in forming the plan of the hofpital near Hoxton, founded by Robert Afk alderman of London, who appointed Archbifhop Tillotfon one of his executors; and in December the fame year, Hooke was created doctor of phyfic, by a warrant from that prelate. In June 1696, the chancery fuit with Sir John Cutler was determined in his favour, to his inexpreffible fatisfaction. His joy on that occafion was found in his diary thus expreffed; DOMSHLGISSA: that is, *Deo, Optimo, Maximo, fit honor, laus, gloria, in fæcula fæculorum, Amen.* "I was born on this day of July 1635, and God hath given me a new birth: may I never forget his mercies to me! while he gives me breath may I praife him!"

In the fame year 1696, an order was granted to him for repeating moft of his experiments at the expence of the Royal Society, upon a promife of his finifhing the accounts, obfervations, and deductions from them, and of perfecting the defcription of all the inftruments contrived by him; but his increafing illnefs and general decay rendered him unable to perform it. He continued fome years in this wafting condition; and thus languifhing till he was quite emaciated, he died March 3d 1702, at his lodgings in Grefham college, and was buried in St Helen's church, Bifhopfgate ftreet; his corpfe being attended by all the members of the Royal Society then in London.

Dr Hooke's character, in fome refpects, was not one of the moft amiable. In his perfon he exhibited but a mean appearance, being fhort of ftature, very crooked, pale, lean, and of a meagre afpect, with lank brown hair, which he wore very long, and hanging over his face. Suitable to his perfon, his temper was penurious, melancholy, miftruftful: and, though poffeffed of great philofophical knowledge, he had fo much ambition, that he would be thought the only man who could invent or difcover; and thus it has been afferted by fome, that he frequently laid claim to the inventions and difcoveries of others, while he boafted of many of his own which he never communicated. On the contrary his admirers have retorted the charge, and have blamed others with claiming the difcoveries of this philofopher. Without deciding on this point, which feems at leaft fomewhat doubtful, we fhall leave our readers to judge for themfelves, after recommending to their perufal the hiftory of the inventions claimed by Dr Hooke at the end of this article, and the note under the article WATCH, both drawn up, we believe, by Profeffor Robifon. In the religious part of his character he was fo far exemplary, that he always expreffed a great veneration for the Deity; and feldom received any remarkable benefit in life, or made any confiderable difcovery in nature, or invented any ufeful contrivance, or found out any difficult problem, without fetting down his acknowledgment to God, as many places in his diary plainly fhow. He frequently ftudied the facred writings in the original; for he was acquainted with the ancient languages, as well as with all parts of the mathematics.—He wrote, 1. *Lectiones Cutlerianæ*, or Cutlerian Lectures. 2. *Micrographia*, or Defcriptions of minute bodies made by magnifying glaffes. 3. A defcription of heliofcopes. 4. A defcription of fome mechanical improvements of lamps and water-poifes, quarto. 5. Philofophical collections. After his death were publifhed, 6. Pofthumous works collected from his papers by Richard Waller fecretary to the Royal Society.

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Chronological Hiftory of Inventions and Difcoveries by Dr Hooke.

1656, Barometer, a weather-glafs.

1657, A fcapement, for maintaining the vibration of a pendulum.—And not long after, the regulating or balance-fpring for watches.

1658, The double barrelled air-pump.——The conical pendulum.—His firft employment of the conical pendulum was no lefs ingenious and fcientific than it was original. He employed it to reprefent the mutual gravitation of the planets; a fact which he had moft fyftematically announced. He had fhewn, that a force, perfectly analogous to gravity on this earth, operated on the furface of the moon and of Jupiter. Confidering the numerous round pits on the furface of the moon, furrounded with a fort of wall, and having a little eminence in the middle, as the production of volcanoes, he inferred, that the ejected matter fell back again to the moon, as fuch matter falls back again to the earth. He faw Jupiter furrounded with an atmofphere, which accompanied him; and therefore preffed on him, as our air preffes on the earth:—He inferred, that it was the fame kind of power that maintained the fun and other planets in a round form. He inferred a force to the fun from the circulation round him, and he called it a *gravitation;* and faid that it was not the earth which defcribed the ellipfe, but the centre of gravity of the earth and moon. He therefore made a conical pendulum, whofe tendency to a vertical pofition reprefented the gravitation to the fun, and which was projected at right angles to the vertical plane; and fhewed experimentally, how the different proportions of the projectile and centripetal tendencies produced various degrees of eccentricity in the orbit. He then added another pendulum, defcribing a cone round the firft, while this defcribed a cone round the vertical line, in order to fee what point between them defcribed the ellipfe. The refults of the experiment were intricate and unfatisfactory; but the thought was ingenious. He candidly acknowledged, that he had not difcovered the true law of gravitation which would produce the defcription of an ellipfe *round the focus*, owing to his want of due mathematical knowledge; and therefore left this inveftigation to his fuperiors. Sir Ifaac Newton was the happy man who made the difcovery, after having entertained the fame notions of the forces which connected the bodies of the folar fyftem, before he had any acquaintance with Dr Hooke, or knew of his fpeculations.

1660, The engine for cutting clock and watch-wheels.—The chief phenomena of capillary attraction.—The freezing of water a fixed temperature.

1663, The method of fupplying air to a diving bell.—The number of vibrations made by a mufical chord.

1664, His Micrographia was, by the council of the Royal Society, ordered to be printed; but in that work are many juft notions refpecting refpiration, the com-

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position of the atmosphere, and the nature of light, which were afterwards attributed as discoveries to Mayow and others, who, though we are far from supposing that they stole their discoveries from Dr Hooke, were certainly anticipated by him.

1666, A quadrant by reflection.

1667, The marine barometer.—The gage for sounding unfathomable depths.

1668, The measurement of a degree of the meridian, with a view to determine the figure of the earth, by means of a zenith sector.

1669, The fact of the *conservatio virium vivarum*, and that in all the productions and extinctions of motion, the accumulated forces were as the squares of the final or initial velocities. This doctrine he announces in all its generality and importance, deducing from it all the consequences which John Bernoulli values himself so highly upon, and which are the chief facts adduced by Leibnitz in support of his doctrine of the forces of bodies in motion. But Hooke was perfectly aware of their entire correspondence with the Cartesian or common doctrine, and was one of the first in applying the celebrated 39th proposition of Newton's Principia to his former positions on this subject, as a mathematical demonstration of them.

1673, That the catenarea was the best form of an arch.

1674, Steam engine on Newcomen's principle.

1679, That the air was the sole source of heat in burning: That combustion is the solution of the inflammable vapour in air; and that in this solution the air gives out its heat and light. That nitre explodes and causes bodies to burn without air, because it consists of this air, accompanied by its heat and light in a condensed or solid state; and air supports flame, because it contains the same ingredients that gunpowder doth, that is, a nitrous spirit: That this air dissolves something in the blood while it is exposed to it in the lungs in a very expanded surface, and when saturated with it, can no longer support life nor flame; but in the act of solution, it produces animal heat: That the arterial and venal blood differ on account of this something being wanting in one of them. In short, the fundamental doctrines of modern chemistry are systematically delivered by Dr Hooke in his Micrographia, published in 1664, and his Lampas, published in 1677.

1680, He first observed the secondary vibrations of elastic bodies, and their connection with harmonic sounds. A glass containing water, and excited by a fiddlestick, threw the water into undulations, which were square, hexagonal, octagonal, &c. shewing that it made vibrations subordinate to the total vibration; and that the fundamental sound was accompanied by its octave, its twelfth, &c.

1681, He exhibited musical tones by means of toothed wheels, whirled round and rubbed with a quill, which dropped from tooth to tooth, and produced tones proportioned to the frequency of the cracks or snaps.

1684, He read a paper before the Royal Society, in which he affirms, that some years before that period he had proposed a method of discoursing at a distance, not by sound, but by sight. He then proceeds to describe a very accurate and complete telegraph, equal, perhaps, in all respects to those now in use. But some years previous to 1684, M. Amontons had not invented his telegraph; so that, though the Marquis of Worcester unquestionably gave the first hint of this instrument, Dr Hooke appears to have first brought it to perfection. See TELEGRAPH; and a book, published 1726, entitled *Philosophical Experiments and Observations* of the late eminent Dr Robert Hooke.

To him also we are indebted for many other discoveries of lesser note; such as the wheel barometer, the universal joint, the manometer, screw divided quadrant, telescopic sights for astronomical instruments, representation of a muscular fibre by a chain of bladders, experiments shewing the inflection of light, and its attraction for solid bodies, the curvilineal path of light through the atmosphere.

HOOKE, *Nathaniel*, author of an esteemed Roman history and other performances. Of this learned gentleman the earliest particulars to be met with are furnished by himself, in the following modest but manly address to the earl of Oxford, dated Oct. 7. 1722: "My Lord, the first time I had the honour to wait upon your lordship since your coming to London, your lordship had the goodness to ask me, what way of life I was then engaged in? A certain *mauvaise honte* hindered me at that time from giving a direct answer. The truth is, my lord, I cannot be said at present to be in any form of life, but rather to live extempore. The late epidemical distemper seized me, I endeavoured to be rich, imagined for a while that I was, and am in some measure happy to find myself at this instant but just worth nothing. If your lordship, or any of your numerous friends, have need of a servant, with the bare qualifications of being able to read and write, and to be honest, I shall gladly undertake any employments your lordship shall not think me unworthy of. I have been taught, my lord, that neither a man's natural pride, nor his self-love, is an equal judge of what is fit for him; and I shall endeavour to remember, that it is not the short part we act, but the manner of our performance, which gains or loses us the applause of Him who is finally to decide of all human actions. My lord, I am just now employed in translating from the French, a History of the Life of the late archbishop of Cambray; and I was thinking to beg the honour of your lordship's name to protect a work which will have so much need of it. The original is not yet published. 'Tis written by the author of the Discourse upon Epic Poetry, in the new edition of Telemaque. As there are some passages in the book of a particular nature, I dare not solicit your lordship to grant me the favour I have mentioned, till you first have perused it. The whole is short, and pretty fairly transcribed. If your lordship could find a spare hour to look it over, I would wait upon your lordship with it, as it may possibly be no unpleasing entertainment. I should humbly ask your lordship's pardon for so long an address in a season of so much business. But when should I be able to find a time in which your lordship's goodness is not employed? I am, with perfect respect and duty, my lord, your lordship's most obliged, most faithful, and most obedient humble servant, NATHANIEL HOOKE." The translation here spoken of was afterwards printed in 12mo, 1723. From this period till his death, Mr Hooke enjoyed the confidence and patronage of men not less distinguished by virtue than by titles. In 17.. he published a translation

Nichols's Anecdotes of Bower, &c.

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lation of Ramſay's Travels of Cyrus, in 4to; in 1733 he reviſed a tranſlation of "The Hiſtory of the Conqueſt of Mexico by the Spaniards, by Thomas Townſend, Eſq;" printed in 2 vols 8vo; and in the ſame year he publiſhed, in 4to, the firſt volume of "The Roman Hiſtory, from the building of Rome to the ruin of the Commonwealth; illuſtrated with maps and other plates." In the dedication to this volume, Mr Hooke took the opportunity of "publicly teſtifying his juſt eſteem for a worthy friend, to whom he had been long and much obliged," by telling Mr Pope, that the diſplaying of his name at the head of thoſe ſheets was "like the hanging out a ſplendid ſign, to catch the traveller's eye, and entice him to make trial of the entertainment the place affords. But, (he proceeds), when I can write under my ſign, that Mr Pope has been here, and was content, who will queſtion the goodneſs of the houſe?" The volume is introduced by "Remarks on the Hiſtory of the Seven Roman Kings, occaſioned by Sir Iſaac Newton's objections to the ſuppoſed 244 years duration of the royal ſtate of Rome." His nervous pen was next employed in digeſting "An Account of the conduct of the Dowager-ducheſs of Marlborough, from her firſt coming to court to the year 1710, in a Letter from herſelf to Lord —— in 1742," 8vo. His reward on this occaſion was conſiderable; and the reputation he acquired by the performance much greater. The circumſtances of this tranſaction are thus related by Dr Maty, in his Memoirs of Lord Cheſterfield, vol. i. p. 116. "The relict of the great duke of Marlborough, being deſirous of ſubmitting to poſterity her political conduct, as well as her lord's, applied to the earl of Cheſterfield for a proper perſon to receive her information, and put the memoirs of her life into a proper dreſs. Mr Hooke was recommended by him for that purpoſe. He accordingly waited upon the ducheſs, while ſhe was ſtill in bed, oppreſſed by the infirmities of age. But, knowing who he was, ſhe immediately got herſelf lifted up, and continued ſpeaking during ſix hours. She delivered to him, without any notes, her account in the moſt lively as well as the moſt connected manner. As ſhe was not tired herſelf, ſhe would have continued longer the buſineſs of this firſt ſitting, had not ſhe perceived that Mr Hooke was quite exhauſted, and wanted refreſhment as well as reſt. So eager was ſhe for the completion of the work, that ſhe inſiſted upon Mr Hooke's not leaving her houſe till he had finiſhed it. This was done in a ſhort time; and her Grace was ſo well pleaſed with the performance, that ſhe complimented the author with a preſent of 5000l. a ſum which far exceeded his expectations. As ſoon as he was free, and permitted to quit the houſe of his benefactreſs, he haſtened to the earl, to thank him for his favour, and communicate to him his good fortune. The perturbation of mind he was under, occaſioned by the ſtrong ſenſe of his obligation, plainly appeared in his ſtammering out his acknowledgments: and he, who had ſucceeded ſo well as the interpreter of her Grace's ſentiments, could ſcarcely utter his own." The ſecond volume of his Roman hiſtory appeared in 1745; when Mr Hooke embraced the fair occaſion of congratulating his worthy friend the earl of Marchmont, on "that true glory, the conſenting praiſe of the honeſt and the wiſe," which his lordſhip had ſo early acquired. To the ſecond volume Mr Hooke added "The Capitoline Marbles, or Conſular Calenders, an ancient Monument accidentally diſcovered at Rome in the year 1545, during the Pontificate of Paul III." In 1758 Mr Hooke publiſhed Obſervations on, I. The Anſwer of M. l'Abbé de Vertot to the earl of Stanhope's Inquiry concerning the Senate of ancient Rome: dated December 1716. II. A Diſſertation upon the Conſtitution of the Roman Senate, by a Gentleman: publiſhed in 1743. III. A Treatiſe on the Roman Senate, by Dr Conyers Middleton: publiſhed in 1747. IV. An Eſſay on the Roman Senate, by Dr Thomas Chapman: publiſhed in 1750;" which he with great propriety inſcribed to Mr Speaker Onſlow. The third volume of Mr Hooke's Roman Hiſtory to the end of the Gallic war, was printed under his inſpection before his laſt illneſs; but did not appear till after his death, which happened in 1764. The fourth and laſt volume was publiſhed in 1771. Hr Hooke left two ſons; of whom one is a divine of the church of England; the other, a doctor of the Sorbonne, and profeſſor of aſtronomy in that illuſtrious ſeminary.

Hooker.

HOOKER, John, *alias* VOWELL, was born in Exeter, about the year 1524, the ſecond ſon of Robert Hooker, who in 1529 was mayor of that city. He was inſtructed in grammar learning by Dr Moreman, vicar of Menhinit in Cornwall, and thence removed to Oxford; but to what college is uncertain. Having left the univerſity, he travelled to Germany, and reſided ſome time at Cologne, where he kept exerciſes in law, and probably graduated. Thence he went to Straſburg, where he ſtudied divinity under the famous Peter Martyr. He now returned to England, and ſoon after viſited France, intending to proceed to Spain and Italy; but was prevented by a declaration of war. Returning therefore again to England, he fixed his reſidence in his native city, where, having married, he was in 1554 elected chamberlain, being the firſt perſon who held that office, and in 1571 repreſented his fellow-citizens in parliament. He died in the year 1601, and was buried in the cathedral church at Exeter. He wrote, among other works, 1. Order and uſage of keeping of parliaments in Ireland. 2. The events of comets or blazing ſtars, made upon the ſight of the comet Pagonia, which appeared in November and December 1577. 3. An addition to the chronicles of Ireland from 1546 to 1568; in the ſecond volume of Holinſhed's chronicle. 4. A deſcription of the city of Exeter, and of the ſondrie aſſaults given to the ſame; Holinſh. chron. vol. iii. 5. A book of enſigns. 6. Tranſlation of the hiſtory of the conqueſt of Ireland from the Latin of Giraldus Cambrenſis; in Holinſh. chron. vol. ii. 7. *Synopſis chorographica*, or an hiſtorical record of the province of Devon; never printed.

HOOKER, *Richard*, a learned divine, was born at Heavy-tree, near Exeter, in the year 1553. Some of his anceſtors were mayors of that city, and he was nephew to *John Hooker* the hiſtorian. By this uncle he was firſt ſupported at the univerſity of Oxford, with the addition of a ſmall penſion from Dr Jewel, biſhop of Saliſbury, who in 1561 got him admitted one of the clerks of Corpus-Chriſti college. In 1573 he was elected ſcholar. In 1577 he took the degree of maſter of arts,

arts, and was admitted fellow the ſame year. In July 1579, he was appointed deputy profeſſor of the Hebrew language. In October, in the ſame year, he was for ſome trivial miſdemeanor expelled the college, but was immediately reſtored. In 1581 he took orders; and, being appointed to preach at St Paul's croſs, he came to London, where he was unfortunately drawn into a marriage with Joan Churchman, the termagant daughter of his hoſteſs. Having thus loſt his fellowſhip, he continued in the utmoſt diſtreſs till the year 1584, when he was preſented by John Cheny, Eſq. to the rectory of Drayton-Beaucham in Buckinghamſhire. In this retirement he was viſited by Mr Edwin Sandys, and Mr George Cranmer, his former pupils. They found him, with a Horace in his hand, tending ſome ſheep in the common field, his ſervant having been ordered home by his ſweet Xantippe. They attended him to his houſe; but were ſoon deprived of his company by an order, from his wife Joan, for him to come and rock the cradle. Mr Sandys's repreſentation to his father, of his tutor's ſituation, procured him the maſterſhip of the Temple. In this ſituation he met with conſiderable moleſtation from one Travers, lecturer of the Temple, and a bigoted Puritan, who in the afternoon endeavoured to confute the doctrine delivered in the morning. From this diſagreeable ſituation he ſolicited Archbiſhop Whitgift to remove him to ſome country retirement, where he might proſecute his ſtudies in tranquillity. Accordingly, in 1591, he obtained the rectory of Boſcomb in Wiltſhire, together with a prebend in the church of Saliſbury, of which he was alſo made ſub-dean. In 1594 he was preſented to the rectory of Biſhopſbourne in Kent, where he died in the year 1600. He was buried in his own pariſh-church, where a monument was erected to his memory by William Cooper, Eſq. He was a meek, pious, and learned divine. He wrote, 1. Eccleſiaſtical politie, in eight books folio. 2. A diſcourſe of juſtification, &c. with two other ſermons, Oxford 1612, 4to. Alſo ſeveral other ſermons printed with the Eccleſiaſtical Politie.

Hooker, in naval architecture, a veſſel much uſed by the Dutch, built like a pink, but rigged and maſted like a hoy.—Hookers will lie nearer a wind than veſſels with croſs-ſails can do. They are from 50 to 200 tons burden, and with a few hands will ſail to the Eaſt Indies.

HOOP, a piece of pliant wood, or iron, bent into a circular form, commonly uſed for ſecuring caſks, &c.

Driving a Hoop, a boyiſh exerciſe, of good effect in rendering the limbs pliable, and for ſtrengthening the nerves.

HOOPER, John, biſhop of Worceſter, and a martyr in the Proteſtant cauſe, was born in Somerſetſhire, and educated at Oxford, probably in Merton-college. In 1518 he took the degree of bachelor of arts, and afterwards became a Ciſtercian monk; but at length, diſliking his fraternity, he returned to Oxford, and there became infected with Lutheraniſm. In 1539 he was made chaplain and houſe-ſteward to Sir John Arundel, who afterwards ſuffered with the protector in the reign of Edward VI. But *that very catholic knight*, as Wood calls him, diſcovering his chaplain to be a heretic, Hooper was obliged to leave the kingdom. After continuing ſome time in France, he returned to England, and lived with a gentleman called *Seintlow*: but being again diſcovered, he eſcaped in the habit of a ſailor to Ireland; thence embarked for the continent, and fixed his abode in Switzerland.—When King Edward came to the crown, Mr Hooper returned once more to his native country. In 1550, by his old patron Sir John Arundel's intereſt with the earl of Warwick, he was conſecrated biſhop of Glouceſter; and in 1552 was nominated to the ſee of Worceſter, which he held *in commendam* with the former. But Queen Mary had ſcarce aſcended the throne, before his lordſhip was impriſoned, tried, and, not chooſing to recant, condemned to the flames. He ſuffered this terrible death at Glouceſter, on the 9th of February 1554, being then near 60 years of age. He was an avowed enemy to the church of Rome, and not perfectly reconciled to what he thought remnants of Popery in the church of England. In the former reign he had been one of Bonner's accuſers, which ſufficiently accounts for his being one of Queen Mary's firſt ſacrifices to the holy ſee. He was a perſon of good parts and learning, as may be found in Fox's Book of Martyrs.

Hooper, *George*, a very learned writer, biſhop of Bath and Wells, was well ſkilled in mathematics, and in the eaſtern learning and languages. He ſat in thoſe ſees above 25 years, often refuſed a ſeat in the privy council, and could not be prevailed upon to accept of the biſhopric of London on the death of Biſhop Compton. He wrote, 1. The church of England free from the imputation of Popery. 2. A diſcourſe concerning Lent. 3. New danger of Preſbytery. 4. An enquiry into the ſtate of the ancient meaſures. 5. *De Valentinianorum hæreſi conjecturæ*. 6. Several ſermons; and other works.

HOOPING-cough. See Medicine *Index*.

HOOPOE. See Upupa, Ornithology *Index*.

HOP, in *Botany*. See Humulus, Botany *Index*.

Hops were firſt brought into England from the Netherlands in the year 1524. They are firſt mentioned in the Engliſh ſtatute-book in the year 1552, viz. in the 5 and 6 of Edw. VI. cap. 5. And by an act of parliament of the firſt year of King James I. anno 1603, cap. 18. it appears, that hops were then produced in abundance in England.

The hop being a plant of great importance in the article of brewing, we ſhall conſider what relates to the culture and management of it, under the following heads:

Of *Soil*. As for the choice of their hop grounds, they eſteem the richeſt and ſtrongeſt grounds the moſt proper: and if it be rocky within two or three feet of the ſurface the hops will proſper well; but they will by no means thrive on a ſtiff clay or ſpongy wet land.

The Kentiſh planters account new land beſt for hops; they plant their hop gardens with apple-trees at a large diſtance, and with cherry-trees between; and when the land hath done its beſt for hops, which they reckon it will in about 10 years, the trees may begin to bear. The cherry-trees laſt about 30 years; and by that time the apple-trees are large, they cut down the cherry-trees.

The Eſſex planters account a moory land the moſt proper for hops.

As to the ſituation of a hop-ground, one that inclines

Hops. clines to the fouth or weft is the moft eligible; but if it be expofed to the north-eaft or fouth-weft winds, there fhould be a fhelter of fome trees at a diftance, becaufe the north-eaft winds are apt to nip the tender fhoots in the fpring; and the fouth-weft winds frequently break and blow down the poles at the latter end of the fummer, and very much endanger the hops.

In the winter-time provide your foil and manure for the hop-ground againft the following fpring.

If the dung be rotten, mix it with two or three parts of common earth, and let it incorporate together till you have occafion to make ufe of it in making your hop hills; but if it be new dung, then let it be mixed as before till the fpring in the next year, for new dung is very injurious to hops.

Dung of all forts was formerly more commonly made ufe of than it is now, efpecially when rotted and turned to mould, and they who have no other manure muft ufe it; which if they do, cows or hogs dung, or human ordure mixed with mud, may be a proper compoft, becaufe hops delight moft in a manure that is cool and moift.

Planting. Hops require to be planted in a fituation fo open, as that the air may freely pafs round and between them, to dry up and diffipate the moifture, whereby they will not be fubject to fire-blafts, which often deftroy the middles of large plantations while the outfides remain unhurt.

As for the preparation of the ground for planting, it fhould, in the preceding winter, be ploughed and harrowed even; and then lay upon it in heaps a good quantity of frefh rich earth, or well-rotted dung and earth mixed together, fufficient to put half a bufhel in every hole to plant the hops in, unlefs the natural ground be very frefh and good.

The hills where the hops are to be planted fhould be eight or nine feet afunder, that the air may freely pafs between them; for in clofe plantations they are very fubject to what the hop-planters call the *fire-blaft.*

If the ground is intended to be ploughed with horfes between the hills, it will be beft to plant them in fquares chequerwife; but if the ground is fo fmall that it may be done with the breaft-plough or fpade, the holes fhould be ranged in a quincunx form. Which way foever you make ufe of, a ftake fhould be ftuck down at all the places where the hills are to be made.

Perfons ought to be very curious in the choice of the plants as to the kind of hop; for if the hop-garden be planted with a mixture of feveral forts of hops that ripen at feveral times, it will caufe a great deal of trouble, and be a great detriment to the owner.

The two beft forts are the white and the gray bind; the latter is a large fquare hop, more hardy, and is the more plentiful bearer, and ripens later than the former.

There is alfo another fort of the white bind, which ripens a week or ten days before the common; but this is tenderer, and a lefs plentiful bearer; but it has this advantage, that it comes firft to market.

But if three grounds, or three diftant parts of one ground, be planted with thefe three forts, there will be this conveniency, that they may be picked fucceffively as they become ripe. The fets fhould be five or fix inches long, with three or more joints or buds on them. Hops.

If there be a fort of hop you value, and would increafe plants and fets from, the fuperfluous binds may be laid down when the hops are tied, cutting off the tops, and burying them in the hill; or when the hops are dreffed, all the cuttings may be faved; for almoft every part will grow, and become a good fet the next fpring.

As to the feafons of planting hops, the Kentifh planters beft approve the months of October and March, both which fometimes fucceed very well; but the fets are not to be had in October, unlefs from fome ground that is to be deftroyed; and likewife there is fome danger that the fets may be rotted, if the winter prove very wet; therefore the moft ufual time of procuring them is in March, when the hops are cut and dreffed.

As to the manner of planting the fets, there fhould be five good fets planted in every hill, one in the middle, and the reft round about floping, the tops meeting at the centre; they muft ftand even with the furface of the ground; let them be preffed clofe with the hand, and covered with fine earth, and a ftick fhould be placed on each fide the hill to fecure it.

The ground being thus planted, all that is to be done more during that fummer, is to keep the hills clear from weeds, and to dig up the ground about the month of May, and to raife a fmall hill round about the plants. In June you muft twift the young bind or branches together into a bunch or knot; for if they are tied up to fmall poles the firft year, in order to have a few hops from them, it will not countervail the weakening of the plants.

A mixture of compoft or dung being prepared for your hop-ground, the beft time for laying it on, if the weather prove dry, is about Michaelmas, that the wheels of the dung-cart may not injure the hops, nor furrow the ground: if this be not done then, you muft be obliged to wait till the froft has hardened the ground, fo as to bear the dung-cart; and this is alfo the time to carry on your new poles, to recruit thofe that are decayed, and to be caft out every year.

If you have good ftore of dung, the beft way will be to fpread it in the alleys all over the ground, and to dig it in the winter following. The quantity they will require will be 40 loads to an acre, reckoning about 30 bufhels to the load.

If you have not dung enough to cover all the ground in one year, you may lay it on one part one year, and on the reft in another, or a third; for there is no occafion to dung the ground after this manner oftener than once in three years.

Thofe who have but a fmall quantity of dung, ufually content themfelves with laying on about twenty loads upon an acre every year; this they lay only on the hills, either about November, or in the fpring; which laft fome account the beft time, when the hops are dreffed, to cover them after they are cut; but if it be done at this time, the compoft or dung ought to be very well rotted and fine.

Dreffing. As to the dreffing of the hops, when the hop-ground is dug in January or February, the earth about the hills, and very near them, ought to be taken away

away with a ſpade, that you may come the more conveniently at the ſtock to cut it.

About the end of February, if the hops were planted the ſpring before, or if the ground be weak, they ought to be dreſſed in dry weather; but elſe, if the ground be ſtrong and in perfection, the middle of March will be a good time: and the latter end of March, if it be apt to produce over-rank binds, or the beginning of April, may be ſoon enough.

Then having with an iron picker cleared away all the earth out of the hills, ſo as to clear the ſtock to the principal roots, with a ſharp knife you muſt cut off all the ſhoots which grew up with the binds the laſt year; and alſo all the young ſuckers, that none be left to run in the alley, and weaken the hill. It will be proper to cut one part of the ſtock lower than the other, and alſo to cut that part low that was left higheſt the preceding year. By purſuing this method you may expect to have ſtronger buds, and alſo keep the hill in good order.

In dreſſing thoſe hops that have been planted the year before, you ought to cut off both the dead tops and the young ſuckers which have ſprung up from the ſets, and alſo to cover the ſtocks with fine earth a finger's length in thickneſs.

The poling. About the middle of April the hops are to be poled, when the ſhoots begin to ſprout up; the poles muſt be ſet to the hills deep into the ground, with a ſquare iron picker or crow, that they may the better endure the winds; three poles are ſufficient for one hill. Theſe ſhould be placed as near the hill as may be, with their bending tops turned outwards from the hill, to prevent the binds from entangling; and a ſpace between two poles ought to be left open to the ſouth to admit the ſun-beams.

The poles ought to be in length 16 or 20 feet, more or leſs according as the ground is in ſtrength; and great care muſt be taken not to overpole a young or weak ground, for that will draw the ſtock too much, and weaken it. If a ground be overpoled, you are not to expect a good crop from it; for the branches which bear the hops will grow very little till the binds have over-reached the poles, which they cannot do when the poles are too long. Two ſmall poles are ſufficient for a ground that is young.

If you wait till the ſprouts or young binds are grown to the length of a foot, you will be able to make a better judgement where to place the largeſt poles; but if you ſtay till they are ſo long as to fall into the alleys, it will be injurious to them, becauſe they will entangle one with another, and will not claſp about the pole readily.

Maple or aſpen poles are accounted the beſt for hops, on which they are thought to proſper beſt, becauſe of their warmth; or elſe, becauſe the climbing of the hop is promoted by means of the roughneſs of the bark. But for durability, aſhen or willow poles are preferable; but cheſnut poles are the moſt durable of all.

If after the hops are grown up you find any of them have been under-poled, taller poles may be placed nearer thoſe that are too ſhort to receive the binds from them.

The tyeing. As to the tying of hops, the buds that do not claſp of themſelves to the neareſt pole when they are grown to three or four feet high, muſt be guided to it by the hand, turning them to the ſun, whoſe courſe they will always follow. They muſt be bound with withered ruſhes, but not ſo cloſe as to hinder them from climbing up the pole.

This you muſt continue to do till all the poles are furniſhed with binds, of which two or three are enough for a pole; and all the ſprouts and binds that you have no occaſion for are to be plucked up; but if the ground be young, then none of theſe uſeleſs binds ſhould be plucked up, but ſhould be wrapt up together in the middle of the hill.

When the binds are grown beyond the reach of your hands, if they forſake the poles, you ſhould make uſe of a ſtand-ladder in tying them up.

Towards the latter end of May, when you have made an end of tying them, the ground muſt have the ſummer dreſſing: this is done by caſting up with the ſpade ſome fine earth into every hill; and a month after this is done, you muſt hoe the alleys with a Dutch hoe, and make the hills up to a convenient bigneſs.

Gathering. About the middle of July hops begin to blow, and will be ready to gather about Bartholomew Tide. A judgment may be made of their ripeneſs by their ſtrong ſcent, their hardneſs, and the browniſh colour of their ſeed.

When by theſe tokens they appear to be ripe, they muſt be picked with all the expedition poſſible; for if at this time a ſtorm of wind ſhould come, it would do them great damage by breaking the branches, and bruiſing and diſcolouring the hops; and it is very well known that hops, being picked green and bright, will ſell for a third part more than thoſe which are diſcoloured and brown.

The moſt convenient way of picking them is into a long ſquare frame of wood, called a *bin*, with a cloth hanging on tenter-hooks within it, to receive the hops as they are picked.

The frame is compoſed of four pieces of wood joined together, ſupported by four legs, with a prop at each end to bear up another long piece of wood placed at a convenient height over the middle of the bin; this ſerves to lay the poles upon which are to be picked.

The bin is commonly eight feet long, and three feet broad; two poles may be laid on it at a time, and ſix or eight perſons may work at it, three or four on each ſide.

It will be beſt to begin to pick the hops on the eaſt or north ſide of your ground, if you can do it conveniently; this will prevent the ſouth-weſt wind from breaking into the garden.

Having made choice of a ſpot of the ground containing 11 hills ſquare, place the bin upon the hill which is in the centre, having five hills on each ſide; and when theſe hills are picked, remove the bin into another piece of ground of the ſame extent, and ſo proceed till the whole hop-ground is finiſhed.

When the poles are drawn up to be picked, you muſt take great care not to cut the binds too near the hills, eſpecially when the hops are green, becauſe it will make the ſap to flow exceſſively.

The hops muſt be picked very clean i. e. free from leaves and ſtalks; and, as there ſhall be occaſion, two or

Hops.

or three times in a day the bin muſt be emptied into a hop-bag made of coarſe linen cloth, and carried immediately to the oaſt or kiln in order to be dried; for if they ſhould be long in the bin or bag, they will be apt to heat and be diſcoloured.

If the weather be hot, there ſhould no more poles be drawn than can be picked in an hour, and they ſhould be gathered in fair weather, if it can be, and when the hops are dry; this will ſave ſome expence in firing, and preſerve their colour better when they are dried.

The crop of hops being thus beſtowed, you are to take care of the poles againſt another year, which are beſt to be laid up in a ſhed, having firſt ſtripped off the haulm from them; but if you have not that conveniency, ſet up three poles in the form of a triangle, or ſix poles (as you pleaſe) wide at bottom; and having ſet them into the ground, with an iron picker, and bound them together at the top, ſet the reſt of your poles about them; and being thus diſpoſed, none but thoſe on the outſide will be ſubject to the injuries of the weather, for all the inner poles will be kept dry, unleſs at the top; whereas, if they were on the ground, they would receive more damage in a fortnight than by their ſtanding all the reſt of the year.

Drying. The beſt method of drying hops is with charcoal on an oaſt or kiln, covered with hair-cloth, of the ſame form and faſhion that is uſed for drying malt. There is no need to give any particular directions for making theſe, ſince every carpenter or bricklayer in thoſe countries where hops grow, or malt is made, knows how to build them.

The kiln ought to be ſquare, and may be of 10, 12, 14, or 16 feet over at the top, where the hops are laid, as your plantation requires, and your room will allow. There ought to be a due proportion between the height and breadth of the kiln and the beguels of the ſteddle where the fire is kept, viz. if the kiln be 12 feet ſquare on the top, it ought to be nine feet, and a half ſquare, and ſo proportionable in other dimenſions.

The hops muſt be ſpread even upon the oaſt a foot thick or more, if the depth of the curb will allow it; but care is to be taken not to overload the oaſt if the hops be green or wet.

The oaſt ought to be firſt warmed with a fire before the hops are laid on, and then an even ſteady fire muſt be kept under them; it muſt not be too fierce at firſt, leſt it ſcorch the hops, nor muſt it be ſuffered to ſink or ſlacken, but rather be increaſed till the hops be nearly dried, leſt the moiſture or ſweat which the fire has raiſed fall back or diſcolour them. When they have lain about nine hours they muſt be turned, and in two or three hours more they may be taken off the oaſt. It may be known when they are well dried by the brittleneſs of the ſtalks and the eaſy falling off of the hop leaves.

It is found by experience that the turning of hops, though it be after the moſt eaſy and beſt manner, is not only an injury or waſte to the hops, but alſo an expence of fuel and time, becauſe they require as much fuel and as long a time to dry a ſmall quantity, by turning them, as a large one. Now this may be prevented by having a cover (to be let down and raiſed at pleaſure) to the upper bed whereon the hops lie. This cover may alſo be tinned, by nailing ſingle tin plates over the face of it; ſo that when the hops begin to dry, and are ready to burn, i. e. when the greateſt part of their moiſture is evaporated, then the cover may be let down within a foot or leſs of the hops (like a reverberatory), which will reflect the heat upon them, ſo that the top will ſoon be as dry as the lowermoſt, and every hop be equally dried.

Bagging. As ſoon as the hops are taken off the kiln, lay them in a room for three weeks or a month to cool, give, and toughen; for if they are bagged immediately they will powder, but if they lie a while (and the longer they lie the better, provided they be covered cloſe with blankets to ſecure them from the air) they may be bagged with more ſafety, as not being liable to be broken to powder in treading; and this will make them bear treading the better, and the harder they are trodden the better they will keep.

The common method of bagging is as follows: they have a hole made in an upper floor, either round or ſquare, large enough to receive a hop-bag, which conſiſts of four ells and a half of ell-wide cloth, and alſo contains ordinarily two hundred and a half of hops; they tie a handful of hops in each lower corner of the bag to ſerve as handles to it: and they faſten the mouth of the bag, ſo placed that the hoop may reſt upon the edges of the hole.

Then he that is to tread the hops down into the bag, treads the bag on every ſide, another perſon continually putting them in as he treads them till the bag is full; which being well filled and trodden, they unrip the faſtening of the bag to the hoops, and let it down, and cloſe up the mouth of the bag, tying up a handful of hops in each corner of the mouth, as was done in the lower part.

Hops being thus packed, if they have been well dried, and laid up in a dry place, will keep good ſeveral years; but care muſt be taken that they be neither deſtroyed nor ſpoiled by the mice making their neſts in them.

Produce. The charge of an acre of hop-ground in moſt parts of England where hops are cultivated, is computed thus: three pounds for the huſbandry, four pounds for the wear of the poles, five pounds for picking and drying, one pound ten ſhillings for dung, one pound for rent, though in ſome places they pay four or five pounds an acre yearly for the rent of the land, and ten ſhillings for tythe; in all 15l. a-year. The hop-planters in England reckon that they have but a moderate return, when the produce of an acre of hops does not ſell for more than 30l. They frequently have fifty, ſixty, eighty, or a hundred pounds; and in a time of general ſcarcity conſiderably more: ſo that, upon the whole, if the total charge of an acre of hops is computed at fifteen pounds a-year, and its average produce at thirty pounds, the clear profit from an acre will be fifteen pounds a-year. But the plantation of hops has lately ſo much increaſed, and the average produce ſo much exceeded the conſumption, that hops have been with many planters rather a loſing than a very profitable article.

Uſes. In the ſpring-time, while the bud is yet tender, the tops of the plant being cut off, and boiled, are ate like aſparagus, and found very wholeſome, and effectual to looſen the body; the heads and tendrils are

good.

good to purify the blood in the ſcurvy, and moſt cutaneous diſeaſes; decoctions of the flowers, and ſyrups thereof, are of uſe againſt peſtilential fevers; juleps and apozems are alſo prepared with hops for hypochondriacal and hyſterical affections, and to promote the menſes.

A pillow ſtuffed with hops and laid under the head, is ſaid to procure ſleep in fevers attended with a delirium. But the principal uſe of hops is in the brewery for the preſervation of malt liquors; which by the ſuperaddition of this balſamic, aperient, and diuretic bitter, become leſs viſcid, leſs apt to turn ſour, more detergent, more diſpoſed to paſs off by urine, and in general more ſalubrious. They are ſaid to contain an agreeable odoriferous principle, which promotes the vinous fermentation. When ſlightly boiled or infuſed in warm water, they increaſe its ſpirituoſity.

Laws relating to Hops. By 9 Anne, cap. 121. an additional duty of 3d. a pound is laid on all hops imported, over and above all other duties; and hops landed before entry and payment of duty, or without warrant for landing, ſhall be forfeited and burnt; the ſhip alſo ſhall be forfeited, and the perſon concerned in importing or landing ſhall forfeit 5l. a hundred weight; 7 Geo. II. cap. 19. By 9 Anne, cap. 12. there ſhall be paid a duty of 1d. for every pound of hops grown in Great Britain, and made fit for uſe, within ſix months after they are cured and bagged; and hop-grounds are required to be entered on pain of 40s. an acre. Places of curing and keeping are alſo to be entered, on pain of 50l. which may be viſited by an officer at any time without obſtruction, under the penalty of 20l. All hops ſhall, within ſix weeks after gathering, be brought to ſuch places to be cured and bagged, on pain of 5s. a pound. The rebagging of foreign hops in Britiſh bagging for ſale or exportation, incurs a forfeiture of 10l. a hundred weight; and defrauding the king of his duty by uſing twice or oftener the ſame bag, with the officer's mark upon it, is liable to a penalty of 40l. The removal of hops before they have been bagged and weighed, incurs a penalty of 50l. Concealment of hops ſubjects to the forfeiture of 20l. and the concealed hops; and any perſon who ſhall privately convey away any hops, with intent to defraud the king and owner, ſhall forfeit 5s. a pound. And the duties are required to be paid within ſix months after curing, bagging, and weighing, on pain of double duty, two-thirds to the king, and one-third to the informer. No common brewer, &c. ſhall uſe any bitter ingredient inſtead of hops, on pain of 20l. Hops which have paid the duty may be exported to Ireland; but by 6 Geo. II. cap. 1. there ſhall be no drawback; and by 7 Geo. II. cap. 19. no foreign hops ſhall be landed in Ireland. Notice of bagging and weighing ſhall be ſent in writing to the officer, on pain of 50l. 6 Geo. cap. 21. And by 14 Geo. III. cap. 68. the officer ſhall, on pain of 5l. weigh the bags or pockets, and mark on them the true weight or tare, the planter's name and place of abode, and the date of the year in which ſuch hops were grown; and the altering or forging, or obliterating ſuch mark, incurs a forfeiture of 10l.—The owners of hops ſhall keep at their oaſts, &c. juſt weights and ſcales, and permit the officer to uſe them on pain of 20l. 6 Geo. cap. 21. And by 10 Geo. III. cap. 44. a penalty of 100l. is inflicted for falſe ſcales and weights. The owners are allowed to uſe caſks inſtead of bags, under the ſame regulations. 6 Geo. cap. 21. If any perſon ſhall mix with hops any drug to alter the colour or ſcent, he ſhall forfeit 5l. a hundred weight. If any perſon ſhall unlawfully and maliciouſly cut hop binds growing on poles in any plantation, he ſhall be guilty of felony without benefit of clergy. 6 Geo. II. cap. 37.

HOPE, in *Ethics*, is the deſire of ſome good, attended with a belief of the poſſibility at leaſt, of obtaining it, and enlivened with joy, greater or leſs, according to the greater or leſs probability of our poſſeſſing the object of our hope. Alexander, preparing for his Aſian expedition, diſtributed his hereditary dominions among his friends; allotting to ſome villages, to others boroughs, to others cities; and being aſked what he had reſerved for himſelf, replied, Hope.

Hope, Good, Cape of. See *Good Hope*.

HOPEA, a genus of plants belonging to the polydelphia claſs. See BOTANY *Index*.

HOPLITES, HOPLITÆ (formed of ὁπλον *armour*), in antiquity, were ſuch of the candidates at the Olympic and other ſacred games as ran races in armour.

One of the fineſt pieces of the famous Parrhaſius was a painting which repreſented two hoplites; the one running, and ſeeming to ſweat large drops; the other laying his arms down, as quite ſpent and out of breath.

HOPLITODROMOS (formed of ὁπλον *armour*; and δρεμω *I run*), in the ancient gymnaſtic ſports, a term applied to ſuch perſons as went through thoſe toilſome and robuſt exerciſes in complete armour; by which the exerciſe became much more violent, and the wearing of armour in the time of battle much more eaſy.

HOPLOMACHI, Οπλομαχοι (compoſed of ὁπλον *armour*, and μαχομαι *I fight*), in antiquity, were a ſpecies of gladiators who fought in armour; either completely armed from head to foot, or only with a caſk and cuiraſs.

HOPPER, a veſſel in which ſeed-corn is carried at the time of ſowing.

The word is alſo uſed for that wooden trough in a mill, into which the corn is put to be ground.

HOR, a mountain, or mountainous tract of Arabia Petræa, ſituated in that circuit which the Iſraelites took to the ſouth and ſouth-eaſt of Edom in their way to the borders of Moab: on this mountain Aaron died. The inhabitants were called *Horites*. This tract was alſo called *Seir*, either from a native Horite, or from Eſau, by way of anticipation from his hairy habit of body; whoſe poſterity drove out the Horites.

HORÆ. See HOURS.

HORÆA, in antiquity, ſolemn ſacrifices, conſiſting of fruits, &c. offered in ſpring, ſummer, autumn, and winter; that heaven might grant mild and temperate weather. Theſe, according to Meurſius, were offered to the goddeſſes called Ὡραι, i. e. *Hours*, who were three in number, attended upon the Sun, preſided over the four ſeaſons of the year, and had divine worſhip paid them at Athens.

HORAPOLLO, or HORUS APOLLO, a grammarian of Panaplus in Egypt, according to Suidas, who firſt taught at Alexandria, and then at Conſtantinople under

under the reign of Theodoſius. There are extant, under his name, two books on the hieroglyphics of the Egyptians: which Aldus firſt publiſhed in Greek in 1505, in folio; and they have often been publiſhed ſince, with a Latin verſion and notes. It is not certain, however, that the grammarian of Alexandria was the author of theſe books; they being rather thought to belong to another Horapollo of more ancient date: on which head, ſee *Fabricius's Bibliotheca Græca.*

HORATII, three Roman brothers, who, under the reign of Tullus Hoſtilius, fought againſt the three Curiatii, who belonged to the Alban army. Two of the Horatii were firſt killed; but the third, by his addreſs, ſucceſſively ſlew the three Curiatii, and by this victory rendered the city of Alba ſubject to the Romans. See ROME.

HORATIUS, ſurnamed *Cocles* from his loſing an eye in combat, was nephew to the conſul Horatius Pulvillus, and deſcended from one of the three brothers who fought againſt the Curiatii. Porſenna, laying ſiege to Rome, drove the Romans from Janiculum; and purſued them to the wooden bridge over the Tiber, which joined the city to Janiculum. Largius, Herminius, and Horatius Cocles, ſuſtained the ſhock of the enemy on the bridge, and prevented their entering the city with the Romans; but Largius and Herminius having paſſed the bridge, Horatius Cocles was left alone, and repulſed the enemy till the bridge was broken under him: he then threw himſelf armed into the Tiber, ſwam acroſs the river, and entered Rome in triumph.

HORATIUS, *Quintus Flaccus*, the moſt excellent of the Latin poets of the lyric and ſatirical kind, and the moſt judicious critic in the reign of Auguſtus, was the grandſon of a freedman, and was born at Venuſium 64 B. C. He had the beſt maſters in Rome, after which he completed his education at Athens. Having taken up arms, he embraced the party of Brutus and Caſſius, but left his ſhield at the battle of Philippi. Some time after, he gave himſelf up entirely to the ſtudy of polite literature and poetry. His talents ſoon made him known to Auguſtus and Mecænas, who had a particular eſteem for him, and loaded him with favours. Horace alſo contracted a ſtrict friendſhip with Agrippa, Pollio, Virgil, and all the other great men of his time. He lived without ambition, and led a tranquil and agreeable life with his friends; but was ſubject to a defluxion in his eyes. He died at the age of 57. There are ſtill extant his Odes, Epiſtles, Satires, and Art of Poetry; of which there have been a great number of editions. The beſt are thoſe of the Louvre, in 1642, folio; of Paris 1691, quarto; of Cambridge, 1699; and that with Bentley's emendations, printed at Cambridge in 1711.

HORD, in *Geography*, is uſed for a company of wandering people, which have no ſettled habitation, but ſtroll about, dwelling in waggons or under tents, to be ready to ſhift as ſoon as the herbage, fruit, and the preſent province, is eaten bare: ſuch are ſeveral tribes of the Tartars, particularly thoſe who inhabit beyond the Wolga, in the kingdoms of Aſtracan and Bulgaria.

A hord conſiſts of 50 or 60 tents, ranged in a circle, and leaving an open place in the middle. The inhabitants in each hord uſually form a military company or troop, the eldeſt whereof is commonly the captain, and depends on the general or prince of the whole nation.

HORDEUM, BARLEY, a genus of plants belonging to the triandria claſs; and in the natural method ranking under the 4th order, *Gramina*. See BOTANY *Index.*

HORDICALIA, or HORDICIDIA, in antiquity, a religious feaſt held among the Romans, wherein they ſacrificed cattle big with young. This feaſt fell on April 15. on which day they ſacrificed 30 cows with calf to the goddeſs Tellus or the Earth; part of them were ſacrificed in the temple of Jupiter. The calves taken out of their bellies were burnt to aſhes at firſt by the pontifices, afterwards by the eldeſt of the veſtal virgins.

HOREB, or OREB, a mountain of Arabia Petræa, contiguous to and on the ſouth ſide of Mount Sinai; the ſcene of many miraculous appearances.

HORESTI (Tacitus), a people of Britain, beyond Solway frith. Now *Eſkdale* (Camden).

HORITES, an ancient people, who at the beginning dwelt in the mountains of Seir beyond Jordan (Gen. xiv. 6.) They had princes, and were powerful, even before Eſau made a conqueſt of their country, (*id.* xxxvi. 20—30.) The Horites, the deſcendants of Seir, and the Edomites, ſeem afterwards to have been confounded, and to have compoſed but one people (Deut. ii. 2. xxxiii. 2. and Judg. v. 4.). They dwelt in Arabia Petræa, and Arabia Deſerta, to the ſouth-eaſt of the promiſed land. We find the Hebrew word חורים *Chorim*, which in the book of Geneſis is tranſlated *Horites*, to be uſed in an appellative ſenſe in ſeveral other paſſages of ſcripture, and to ſignify nobles, or great and powerful men (1 Kings xxi. 8. 11. and Neh. ii. 16. iv. 14. v. 7. vi. 17. vii. 5. xii. 17. Eccl. x. 17. Iſa. xxxiv. 12. Jer. xxvii. 20. xxxix. 6.); and it is very probable that the Greeks derived from hence their *heroes*, in like manner as they derived *Anax* "a king," from the ſons of Anak, the famous giant in Paleſtine.

HOREHOUND, the name of a plant. See MARRUBIUM, BOTANY *Index.*

HORIZON, or HORISON, in *Geography* and *Aſtronomy*, a great circle of the ſphere, dividing the world into two parts or hemiſpheres; the one upper and viſible, the other lower and hid. The word is pure Greek, ὁριζων, which literally ſignifies "bounding or terminating the ſight;" being formed of ὁριζω, *termino, definio*, "I bound, I limit;" whence it is alſo called *finitor*, "finiſher." See ASTRONOMY and GEOGRAPHY.

The horizon is either *rational* or *ſenſible*.

Rational, true, or *aſtronomical* HORIZON, which is alſo called ſimply and abſolutely *the horizon*, is a great circle, whoſe plane paſſes through the centre of the earth, and whoſe poles are the zenith and nadir. It divides the ſphere into two equal parts or hemiſpheres.

Senſible, viſible, or *apparent* HORIZON, is a leſſer circle of the ſphere, which divides the viſible part of the ſphere from the inviſible. Its poles, too, are the zenith and nadir: and conſequently the *ſenſible horizon* is parallel to the *rational*; and it is cut at right angles,

and

and into two equal parts, by the verticals.—The *sensible horizon* is divided into *eastern* and *western*. The *eastern* or *ortive* horizon, is that part of the horizon wherein the heavenly bodies rise. The *western* or *occidual* horizon, is that wherein the stars set. The altitude or elevation of any point of the sphere, is an arch of a vertical circle intercepted between it and the sensible horizon.

By *sensible horizon* is also frequently meant a circle, which determines the segment of the surface of the earth, over which the eye can reach; called also the *physical horizon*. In this sense we say, a spacious *horizon*, a narrow scanty *horizon*.

HORIZONTAL, something that relates to the horizon, is taken in the horizon, or on a level with the horizon.—We say, a *horizontal plane*, *horizontal line*, &c.

Horizontal Dial, is that drawn on a parallel to the horizon: having its gnomon, or style, elevated according to the altitude of the pole of the place for which it is designed. Horizontal dials are, of all others, the most simple and easy. The manner of describing them, see under the article DIAL.

Horizontal Line, in *Perspective*, is a right line drawn through the principal point, parallel to the horizon: or, it is the intersection of the horizontal and perspective planes. See PERSPECTIVE.

Horizontal Plane, is that which is parallel to the horizon of the place, or nothing inclined thereto.

The business of levelling is to find whether two points be in the horizontal plane; or how much the deviation is. See LEVELLING.

Horizontal Plane, in *Perspective*, is a plane parallel to the horizon, passing through the eye, and cutting the perspective plane at right angles.

Horizontal Projection. See GEOGRAPHY *Index*.

Horizontal Range, or *Level Range*, of a piece of ordnance, is the line it describes, when directed parallel to the horizon or horizontal line. See GUNNERY, *passim*.

Horizontal Moon. See MOON, ASTRONOMY *Index*.

Horizontal Speculum. See SPECULUM.

HORMINUM, CLARY, a genus of plants belonging to the didynamia class; and in the natural method ranking under the 52d order, *Verticillatæ*. See BOTANY *Index*.

HORN, in *Physiology*, a hard substance growing on the heads of divers animals, particularly the cloven-footed quadrupeds; and serving them both as weapons of offence and defence.

The horn of animals is of the same nature as their gelatinous matter; and is only that matter charged with a less quantity of water, and a larger quantity of earth, and sufficiently condensed to have a firm and solid consistence. By digesting horn with water in Papin's digester, it may be entirely converted into jelly.

Horn is a perfectly animalised matter, and furnishes in distillation the same principles as all animal matters; that is, at first a pure phlegm, with a degree of heat not exceeding that of boiling water; then a volatile alkaline spirit, which becomes more and more penetrating and strong; a fetid, light, and thin oil; a concrete volatile salt, which forms ramifications upon the sides of the receiver; much air; fetid oil, which becomes more and more black and thick; and lastly, it leaves in the retort a considerable quantity of almost incombustible coal, from which, after its incineration, scarcely any fixed alkali can be obtained.

Animal oil, and particularly that which is drawn first in the distillation of horn, is susceptible of acquiring great thinness and volatility by repeated distillations, and is then called the *oil of dippel*.

The horns of stags, and of other animals of that kind, are the most proper to furnish the animal oil to be rectified in the manner of dippel; because they yield the largest quantity. These horns also differ from the horns of other animals in this, that they contain a larger quantity of the same kind of earth which is in bones; hence they seem to possess an intermediate nature betwixt horns and bones.

Hart's-Horn. See *Hart's-Horn*.

HORNS make a considerable article in the arts and manufactures. Bullocks horns, softened by the fire, serve to make lanthorns, combs, knives, ink-horns, tobacco-boxes, &c.

Dyeing of Horn.—Black is performed by steeping brass in aquafortis till it be returned green: with this the horn is to be washed once or twice, and then put into a warmed decoction of logwood and water. Green is begun by boiling it, &c. in alum-water; then with verdigrise, ammoniac, and white-wine vinegar; keeping it hot therein till sufficiently green. Red is begun by boiling it in alum-water; and finished by decoction in a liquor compounded of quick-lime steeped in rain water, strained, and to every pint an ounce of Brazil-wood added. In this decoction the bone, &c. is to be boiled till sufficiently red.

Dr Lewis informs us that horns receive a deep black stain from solution of silver. It ought to be diluted to such a degree as not sensibly to corrode the subject; and applied two or three times, if necessary, at considerable intervals, the matter being exposed as much as possible to the sun, to hasten the appearance and deepening of the colour.

Dyeing or staining Horn to imitate Tortoise-shell.—The horn to be dyed must be first pressed into proper plates, scales, or other flat form; and the following mixture prepared. Take of quick-lime two parts, and of litharge one part; temper them together to the consistence of a soft paste with soap-ley. Put this paste over all the parts of the horn, except such as are proper to be left transparent, in order to give it a nearer resemblance of the tortoise-shell. The horn must remain in this manner covered with the paste till it be thoroughly dry; when, the paste being brushed off, the horn will be found partly opaque and partly transparent, in the manner of tortoise-shell; and when put over a foil, of the kind of latten called *assidue*, will be scarcely distinguishable from it. It requires some degree of fancy and judgment to dispose of the paste in such a manner as to form a variety of transparent parts, of different magnitudes and figures, to look like the effect of nature: and it will be an improvement to add semitransparent parts; which may be done by mixing whiting with some of the paste to weaken its operation in particular places; by which spots of a reddish brown will be produced, which if properly interspersed, especially on the edges of the dark parts, will greatly increase both the beauty of the work, and its similitude with the real tortoise-shell.

Horn is alfo a fort of mufical inftrument of the wind kind; chiefly ufed in hunting, to animate and bring together the dogs and the hunters. The term anciently was, *wind a horn*, all horns being in thofe times compaffed; but fince ftraight horns are come in fafhion, they fay *blow a horn*, and fometimes *found a horn*.—There are various leffons on a horn; as the recheat, double recheat, royal recheat, running or farewell recheat, &c. See Recheat.

The *French horn* is no other than a wreathed or contorted trumpet. It labours under the fame defects as the trumpet itfelf; but thefe have of late been fo palliated, as to require no particular felection of keys for this inftrument. In the beginning of the year 1773, a foreigner, named Spandau, played in a concert at the opera-houfe a concerto, part whereof was in the key of C, with the minor-third; in the performance of which all the intervals feemed to be as perfect as in any wind-inftrument. This improvement was effected by putting his right hand into the bottom or bell of the inftrument, and attempering the founds by the application of his fingers to different parts of the tube.

The Hebrews made ufe of horns, formed of rams horns, to proclaim the jubilee; whence the name Jubilee.

Cape-Horn. See *Terra del Fuego*.

Horn-Beam. See Carpinus, Botany *Index*.

Horn-Bill. See Buceros, Ornithology *Index*.

Horn-Blende, a fpecies of mineral. See Mineralogy *Index*.

Human Horns. In Dr Charles Leigh's natural hiftory of Lancafhire, Chefhire, and the Peak in Derbyfhire, is the print of a woman with two horns on her head. When fhe was 28 years of age an excrefcence grew upon her head like a wen, which continued 30 years, and then grew into two horns. After four years fhe caft them, and in their place grew two others. After four years fhe caft thefe alfo; and the horns which were on her head in 1668 (the time when the account was written) were then loofe. Her picture and one of her horns are in Afhmole's mufeum. In the univerfity library at Edinburgh is preferved a horn which was cut from the head of Elizabeth Love, in the 50th year of her age. It grew three inches above the ear, and was growing feven years.

Horn Diftemper, a difeafe incident to horned cattle, affecting the internal fubftance of the horn commonly called the pith, which it infenfibly waftes, and leaves the horn hollow. The pith is a fpongy bone, the cells of which are filled with an unctuous matter. It is furnifhed with a great number of fmall blood veffels, is overfpread with a thin membrane, and appears to be united by futures with the bones of the head. According to an account of this diftemper, publifhed by Dr Tofts in the Memoirs of the American Academy, vol. i. the faid fpongy bone is fometimes partly, and fometimes entirely wafted. The horn lofes its natural heat, and a degree of coldnefs is felt upon handling it. The diftemper, however, is feldom fufpected without a particular acquaintance with the other fymptoms, which are a dulnefs in the countenance of the beaft, a fluggifhnefs in moving, a failure of appetite, an inclination to lie down, and, when accompanied with an inflammation of brain, a giddinefs and frequent toffing of the head. The limbs are fometimes affected with ftiffnefs, as in a rheumatifm; in cows the milk often fails, the udder is hard, and in almoft all cafes there is a fudden wafting of the flefh. As foon as the diftemper is difcovered, an opening into the difeafed horn fhould be immediately made; which may be done with a gimlet of a moderate fize, in fuch a part of the horn as is moft favourable for the difcharge. It is recommended as moft prudent to bore at firft two or three inches above the head. If it is found hollow, and the gimlet paffes through to the oppofite fide, and no blood difcharges from the aperture, it may be beft to bore ftill lower, and as near the head as it fhall be judged that the hollownefs extends. This opening is affirmed to be a neceffary meafure, and often gives immediate relief. Care muft be taken to keep it clear, as it is apt to be clogged by a thin fluid that gradually oozes out and fills up the paffage. Some have practifed fawing off the horn; but, according to the beft obfervations, it does not fucceed better than boring. From the cafes Dr Tofts has feen, he is led to conclude that injections are in general unneceffary; that, when the diftemper is early difcovered, no more is required than a proper opening into the horn, keeping it fufficiently clear for the admiffion of frefh air, the removal of the compreffion, and the difcharge of floating matter. But when the diftemper has communicated its effects to the brain, fo as to produce a high degree of inflammation, it is much to be doubted whether any method of cure will fucceed.

Horn-Fifh, *Gar-fifh*, or *Sea-needle*. See Esox, Ichthyology *Index*.

Horn-Work, in fortification, an outwork compofed of two demi-baftions joined by a curtain. See Fortification.

HORNBY, a town of England, in Lancafhire, feated on a branch of the river Lune, and beautified with a handfome parochial chapel. The ruins of a decayed caftle are ftill to be feen here. W. Long. 2. 20. N. Lat. 54. 6.

HORN-castle, a town of England, in Lincolnfhire. It had a caftle, as the name imports; from the architecture of which, and the Roman coins that are fometimes dug up here, it is thought to have been a camp or ftation of the Romans. The town is well built, and is almoft furrounded with water. It is a figniory of 13 lordfhips. In thefe lordfhips there are feveral chapels for the convenience of the inhabitants, who are at too great a diftance from the mother-church, and pretty numerous. It has a market on Saturdays, and fairs in June and Auguft.

HORNDON, a town of Effex in England. It ftands near a rivulet, that at a fmall diftance from hence falls into the Thames, which is there called the *Hope*. E. Long. 0. 30. N. Lat. 51. 20.

HORNE, George, an Englifh prelate of great eminence, was born in the vicinity of Maidftone, in the county of Kent, in the year 1730. His father was rector of Otham, and having for fome time acted in the capacity of a tutor at Oxford, was well qualified to fuperintend the education of his fon George. However, that he might not be fpoiled by too long a refidence at home, he was, by the advice of a friend, fent to Maidftone fchool at the age of 13, where he continued under an eminent teacher for two years, and acquired fome knowledge of oriental literature, particularly the Hebrew, and went to Oxford in his 15th year. Here he

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he indefatigably laboured to ſtore his mind with almoſt every branch of uſeful learning, and reſolved to make polite literature ſubſervient to the knowledge and illuſtration of the Scriptures. He ſtudied the Hebrew more attentively, and was wiſely exhorted to abandon the method of Buxtorf, ſo encumbered with that load of rubbiſh, the maſoretic punctuation. The rectitude of his conduct, and the vivacity of his converſation, gained him the eſteem of every perſon with whom he was acquainted. In the year 1749 he was made B. A. and next year was elected to a fellowſhip in Magdalen college, without any ſolicitation upon his part.

About this time he became a proſelyte to what are called the myſteries of *Hutchinſonianiſm*, chiefly through the influence of Mr William Jones. His mind, at the age of 19, was completely fettered by thoſe doctrines, believing that it was the deſign of Sir Iſaac Newton and Dr Clarke, to ſubvert the theology of the Scriptures, and introduce the ſtoical *anima mundi* into the place of the God of the univerſe! Under the influence of ſuch an infatuated whim, it is not aſtoniſhing that he ſhould endeavour to diſcredit the ſyſtem of Newton. He obtained the degree of M. A. in the year 1752, when he engaged in a controverſy on the ſubject of the cherubim, in the Gentleman's Magazine, ſubſcribing himſelf *Ingenuus*. With a view to recommend the writings of Hutchinſon, he publiſhed "A fair, candid, and impartial ſtate of the caſe between Sir Iſaac Newton and Mr Hutchinſon; in which is ſhewn, how far a ſyſtem of phyſics is capable of mathematical demonſtration; how far Sir Iſaac's, as ſuch a ſyſtem, has that demonſtration; and conſequently, what regard Mr Hutchinſon's claim may deſerve to have paid it." In the year 1753 Mr Horne entered into holy orders, and acquired high reputation as a public ſpeaker, as his compoſitions were excellent, and his elocution graceful. While preaching before the univerſity, he introduced ſome of his peculiar notions, which again led him into controverſy. A piece made its appearance, entitled "A word to the Hutchinſonians; or, remarks on three extraordinary ſermons, lately preached before the univerſity of Oxford, by Dr Patten, Mr Wetherell, and Mr Horne." To this our author replied in his "Apology for certain gentlemen in the univerſity of Oxford, aſperſed in a late anonymous pamphlet," &c. The vindication of the hint to the Hutchinſonians, was ſuppoſed to be the production of Dr Kennicott, who became afterwards ſo famous for his labours in collating Hebrew manuſcripts, and his valuable edition of the Hebrew Bible. He (Mr Horne) was choſen proctor of the univerſity in 1758, and on the honourable termination of his authority was created B. D. When Mr (afterwards Dr) Kennicott, gave the world propoſals for collating the text of the Hebrew Bible, for the purpoſe of correcting the original, and preparing for a new tranſlation, Mr Horne was very much alarmed. He falſely apprehended that the adoption of ſuch a meaſure would overwhelm the ſacred text with licentious criticiſm; on which account he publiſhed, in 1760, "A view of Mr Kennicott's method of correcting the Hebrew text, with three queries formed thereon, and humbly ſubmitted to the conſideration of the learned and Chriſtian world." But an acquaintance which thus began in hoſtility was converted afterwards into genuine friendſhip, which continued through the whole of life.

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In 1764, Mr Horne was created D. D. although as yet advanced to no conſpicuous ſtation. On the death of Dr Jenner, the preſident of Magdalen college, Dr Horne was appointed to ſucceed him in a poſt at once honourable and valuable, in the beginning of 1768, after which we are informed that he exchanged a ſingle for a married life. Next year he publiſhed "Conſiderations on the life and death of St John the Baptiſt, being the ſubſtance of ſeveral ſermons preached by him before the univerſity." In 1771, he was choſen chaplain in ordinary to his majeſty, which he held for ten years. In 1772, when a number of clergymen had formed the reſolution of petitioning parliament for relief as to the ſubſcribing the liturgy and thirty-nine articles, Dr Horne determined, if poſſible, to defeat their object, for which purpoſe he publiſhed "Conſiderations on the projected reformation of the church of England, in a letter to Lord North."

He now ſet about the finiſhing of his greateſt work, which had occupied his attention for almoſt 20 years. This was his "Commentary on the Book of Pſalms," which appeared in 1776, in 2 vols quarto. It exhibits profound erudition, a great genius, and fervent piety; and is peruſed with much pleaſure and advantage by every judge of merit. In the ſame year he was choſen vice-chancellor of the univerſity, which he held till the latter end of the year 1780. On the publication of Dr Adam Smith's letter, containing an account of the death of Mr David Hume, Dr Horne, in the year 1777, publicly animadverted upon it, in "A letter to Adam Smith, L. L. D. on the life, death, and philoſophy of his friend David Hume, Eſq. by one of the people called Chriſtians." In this work he expoſes the abſurdities of the Scotch philoſopher's performance, to the contempt of the religious world, with clear and concluſive reaſoning, and keen but good-humoured irony. In 1779, Dr Horne publiſhed "Diſcourſes on various ſubjects and occaſions," in two volumes octavo, which have procured the approbation of all deſcriptions of readers.

As vice-chancellor of the univerſity he became acquainted with Lord North, to whoſe intereſt, joined with that of Lord Hawkeſbury, he was indebted, in 1781, for the deanery of Canterbury. His time was now divided between this city and Oxford, and the conſcientious diſcharge of every part of his complex duty made him univerſally beloved. In 1784 he publiſhed letters on infidelity, ſimilar to his reply to Dr Adam Smith. The books againſt which he levelled his ridicule are, "An apology for the life and writings of David Hume, Eſq.;" Hume's "Dialogues on natural religion; An eſſay on ſuicide by the ſame author, and a treatiſe entitled "Doubts of the Infidels." In the year 1790, when Dr Bagot was tranſlated to the ſee of St Aſaph, Dr Horne was appointed to ſucceed him in the ſee of Norwich. His laſt literary labours were "Obſervations on the caſe of the Proteſtant diſſenters with reference to the corporation and teſt acts," 1790; and "A charge intended to have been delivered to the clergy of the dioceſe of Norwich," at his firſt viſitation, 1791. When he was raiſed to the epiſcopal dignity, his health, always delicate, began rapidly to decline;

decline; but from the waters of Bath he received great relief, to which place he repaired a third time in the harveft of 1791. On his way he was feized with a ftroke of the palfy, and after languifhing for a few weeks, he died at Bath on the 17th of January 1792, in the 62d year of his age.

He was powerfully animated in his laft moments by thofe hopes which fpring from the promifes of the gofpel, and the inexpreffible fatisfaction of a well-fpent life. His erudition was extenfive, his piety fincere, and his whole life exemplary. His charity, both of a public and private nature, was very extenfive, and if not in debt at the end of the year, he was perfectly fatisfied. His pofthumous works are, vols iii. and iv. of "Difcourfes on feveral fubjects and occafions;" a volume of fermons; and "Cautions to the readers of Mr Law."

HORNERS, thofe people whofe bufinefs it is to prepare various utenfils of the horns of cattle. The horners were a very ancient and confiderable fraternity in the city of London fome hundred years ago. In the reign of Edward II. they complained to parliament, that by foreigners buying up the horns in England, they were in danger of being ruined, and this bufinefs loft to the nation. For this reafon was made the ftatute 6 Edw. IV. by which the fale of horns to foreigners (except fuch as the faid horners refufed) was prohibited; and the wardens had power granted them to fearch all the markets in London, and twenty-four miles round, and to infpect Sturbridge and Ely fairs, to prevent fuch practices, and to purchafe horns at ftated prices. But on plaufible pretences this law was repealed in the reign of James I. and thereupon the old evil revived. The horners again applied to parliament, and King Edward's ftatute was renewed (excepting as to the infpection of the fairs), and ftill remains in force. The importation of unwrought horns into this country is alfo prohibited. In 1750, there were exported to Holland 514,500 lantern leaves, befides powder flafks. There was formerly a duty of 20 fhillings a thoufand, under which in 1682 were exported 76,650; but in the reign of George I. this duty was taken off, and thefe and all other manufactures made of horns may be exported free. The prefent company of horners was incorporated January 12. 1638; and confifts of a mafter, two wardens, and nine affiftants, without livery or hall. They have a warehoufe in Spitalfields, to which the horns are fent as brought from town and country-markets, and thence regularly divided, the widows and orphans of deceafed members having equal fhares.

HORNET, a fpecies of wafp. See VESPA, ENTOMOLOGY *Index*.

HORNING, in *Scots Law*, a writing iffuing from the fignet, in his majefty's name, at the inftance of a creditor againft his debtor, commanding him to pay or perform within a certain time, under pain of being declared rebel, and by a caption put in prifon.

HORNSEY, a town in Yorkfhire, 188 miles from London. It is almoft furrounded by a fmall arm of the fea; and the church having a high fteeple, is a noted fea-mark. Not many years ago there was a ftreet here called *Hornfey-beck*, which was wafhed away by the fea, except a houfe or two. E. Long. 0. 6. N. Lat. 54. 0.

HORNSEY, a town of Middlefex, five miles north London. It is a long ftraggling place, fituated in a low valley, but extremely pleafant, having the new river winding through it. Its church, of which Highgate is a hamlet, is fuppofed to be built with the ftones that came from Lodge-Hill, the bifhop of London's hunting-feat in his park here; it having been his manor from the moft ancient times. About a mile nearer this is a coppice of young trees, called *Hornfey-wood*, at the entrance of which is a public-houfe, to which great numbers of perfons refort from the city. This houfe being fituated on the top of a hill, affords a delightful profpect of the neighbouring country.

HORNPIPE, a common inftrument of mufic in Wales, confifting of a wooden pipe, with holes at ftated diftances, and a horn at each end: the one to collect the wind blown into it by the mouth, and the other to carry off the founds as modulated by the performer.

HORNPIPE is alfo the name of an Englifh air, probably derived from the above inftrument. The meafure of this air is triple time, with fix crotchets in a bar; four of which are to be beat with the hand down and two up.

HOROGRAPHY, the art of making or conftructing dials; called alfo dialling, horologiography, gnomonica, fciatherica, photofciatherica, &c.

HOROLOGIUM, Ὡρολογιον, (compofed of ὡρα, *hora*, "time, hour," and λογος, "fpeech, difcourfe,") a common name among ancient writers for any inftrument or machine for meafuring the hours; (fee CHRONOMETER.)—Such are our clocks, watches, fun-dials, &c. See CLOCK, WATCH, DIAL, and CLEPSYDRA.

Modern inventions, and gradual improvements, have given birth to fome new terms that come properly under this head, and annexed new meanings to others totally different from what they had originally. All chronometers that announced the hour by ftriking on a bell, were called *clocks*: thus, we read of pocket-clocks, though nothing could feem more abfurd than to fuppofe that a clock, according to the modern idea, fhould be carried in the pocket. In like manner, all clocks that did not ftrike the hour were called *watches* or *time-pieces*; and the different parts of a ftriking clock were diftinguifhed by the watch-part and the clock-part; the former meaning that part which meafures the time, and the latter the part which proclaims the hours. In the report of Sir Ifaac Newton to the houfe of commons, anno 1713, relative to the longitude act, he ftates the difficulties of afcertaining the longitude by means of a watch: yet it is obvious, from feveral circumftances, that his remarks were directly to be underftood of a time-piece regulated by a pendulum; for his objections are founded on the known properties of the pendulum, fome of which differ effentially from the properties of the balance and fpring. It is alfo to be remembered, that all the attempts of Huygens for finding the longitude were by means of pendulum clocks that did not ftrike the hour, and confequently, according to the language of the times, were called *watches*. At this time fuch machines for meafuring time as are fixed in their place are called *clocks*, if they ftrike the hour: if they do not ftrike the hour, they are called *time-pieces*; and when conftructed with more care, for a more accurate meafure of time, they are called *regulators*. Some artists of late have affected to call such watches as were constructed for astronomical and nautical observations by the name of *time-pieces*, probably to intimate that they possess the advantages of those constructed with a pendulum.

Mr John Harrison first gave the name of *time-keeper* to his watch, for the performance of which he received from parliament the sum of 20,000l. See LONGITUDE.

For the account of the principles of this machine, see TIME-KEEPER. And for the chief improvements that have been made for the more accurate measure of time, see PALLETS, PENDULUM, and SCAPEMENT.

HOROPTER, in *Optics*, is a right line drawn through the point where the two optic axes meet, parallel to that which joins the centres of the two eyes, or the two pupils.

HOROSCOPE, in *Astrology*, the degree or point of the heavens rising above the eastern point of the horizon at any given time when a prediction is to be made of a future event: as, the fortune of a person then born, the success of a design then laid, the weather, &c. The word is composed of ὡρα, *hora*, "hour," and the verb σκοπεω, *video*, "I behold."

Such was at one time the infatuation concerning horoscopes, that Albertus Magnus, Cardan, and others, are said to have had the temerity to draw that of Jesus Christ.

HOROSCOPE is also used for a scheme or figure of the twelve houses, i. e. the twelve signs of the zodiac, wherein is marked the disposition of the heavens for any given time. Thus we say, to draw a horoscope, construct a horoscope, &c. We call it, more peculiarly, *calculating a nativity*, when the life and fortune of a person are the subject of the prediction; for they draw horoscopes of cities, great enterprises, &c. See HOUSE.

HOROSCOPY. See DIVINATION, N° 2.

HORREA, in Roman antiquity, were public magazines of corn and salt-beef, out of which the soldiers were furnished on their march in the military roads of the empire. *Horrea* was also the name which they gave to their granaries.

HORROX, JEREMIAH, an eminent English astronomer in the 17th century, was born at Texteth near Liverpool in Lancashire in 1619. He died, to the great loss of that science and of the world, in the 23d year of his age, after he had just finished his *Venus in Sole visa*; which, with some other works, were published by Dr Wallis, in quarto.

HORROR, strictly signifies such an excess of fear as makes a person tremble. See FEAR, FRIGHT, and TERROR. In medicine, it denotes a shivering and shaking of the whole body, coming by fits. It is common at the beginning of all fevers, but is particularly remarkable in those of the intermittent kind.

HORROR of a Vacuum, was an imaginary principle among the ancient philosophers, to which they ascribed the ascent of water in pumps, and other similar phenomena, which are now known to be occasioned by the weight of the air.

HORSE. See EQUUS, MAMMALIA *Index*.

Horses were very rare in Judæa till Solomon's time. Before him we find no horsemen mentioned in the armies of Israel. David having won a great battle against Hadadezer king of Shobah (2 Sam. viii. 4, 5.), took 1700 horses, and lamed all belonging to the chariots of war, reserving only 100 chariots. The judges and princes of Israel used generally to ride on mules or asses. After David's time, horses were more common in the country of Judah, &c. Solomon is the first king of Judah who had a great number of horses, and he kept them rather for pomp than for war; for we do not read that he made any military expeditions. He had, says the Scripture (1 Kings iv. 26.), 40,000 stalls of horses for his chariots, and 12,000 horsemen distributed in his fortified places (1 Kings x. 26.). He had his horses from Egypt (ibid. ver. 28, 29.); and there was not a set which did not cost him more than 600 shekels, which make of our money about 90l. Moses had forbidden the king of the Hebrews to keep a great number of horses (Deut. xvii. 16.), lest at any time he should be inclined to carry the people back into Egypt.

We read in the second book of Kings (xxiii. 17.), that Josiah took away the horses which the kings of Judah his predecessors had consecrated to the sun. We know the sun was worshipped over all the east, and that the horse, the swiftest of tame beasts, was consecrated to this deity, who was represented as riding in a chariot drawn by the most beautiful and swiftest horses in the world, and performing every day his journey from east to west, in order to communicate his light to mankind. Xenophon describes a solemn sacrifice of horses, which was made with ceremony to the sun: they were all the finest steeds, and were led with a white chariot, crowned, and consecrated to the same god. We may believe that the horses which Josiah removed out of the court of the temple, were appointed for the like sacrifices. The rabbins inform us, that these horses were every morning put to the chariots dedicated to the sun, whereof there is mention made in the same book; and that the king, or some of his officers, got up and rode to meet the sun in its rising, as far as from the eastern gate of the temple to the suburbs of Jerusalem. Others are of opinion, that the horses mentioned in the book of Kings were of wood, stone, or metal, erected in the temple in honour of the sun: Others, that they were horses which none were permitted to ride or fasten to the yoke, but were free, and left to themselves, like those which Julius Cæsar let loose and set at liberty after his passage of the Rubicon.

Horses were used both amongst the Greeks and Romans in war, but were not originally very numerous; for as each horseman provided his own horse, few would be able to bear the expence. Horses for a considerable time were managed by the voice alone, or by a switch, without bridle, saddle, or stirrups. Their harness was skins of beasts, or sometimes cloth. Both horses and men amongst the Greeks underwent a severe probation before their admission into the cavalry. —Horse-races were common amongst the Greeks and Romans, and the place where they ran or breathed their coursers was called *hippodromus*.

Management of a HORSE upon and after a Journey. See that his shoes be not too strait, or press his feet, but be exactly shaped; and let him be shod some days before you begin a journey, that they may be settled to his feet.

Observe that he is furnished with a bitt proper for him,

him, and by no means too heavy, which may incline him to carry low, or to rest upon the hand when he grows weary, which horsemen call *making use of his fifth leg*.

The mouth of the bitt should rest upon his bars about half a finger's-breadth from his tushes, so as not to make him frumble his lips; the curb should rest in the hollow of his beard a little above the chin; and if it gall him, you must defend the place with a piece of buff or other soft leather.

Take notice that the saddle do not rest upon his withers, reins, or back-bone, and that one part of it do not press his back more than another.

Some riders gall a horse's sides below the saddle with their stirrup-leathers, especially if he be lean; to hinder it, you should fix a leather-strap between the points of the fore and hind-bows of the saddle, and make the stirrup-leather pass over them.

Begin your journey with short marches, especially if your horse has not been exercised for a long time; suffer him to stale as often as you find him inclined; and not only so, but invite him to it: but do not excite your mares to stale, because their vigour will be thereby diminished.

It is advisable to ride very softly, for a quarter or half an hour before you arrive at the inn, that the horse not being too warm, nor out of breath, when put into the stable, you may unbridle him: but if your business obliges you to put on sharply, you must then (the weather being warm) let him be walked in a man's hand, that he may cool by degrees; otherwise, if it be very cold, let him be covered with cloths, and walked up and down in some place free from wind; but in case you have not the conveniency of a sheltered walk, stable him forthwith, and let his whole body be rubbed and dried with straw.

Although some people will have their horses legs rubbed down with straw as soon as they are brought into the stable, thinking to supple them by that means; yet it is one of the greatest errors that can be committed, and produces no other effects than to draw down into the legs those humours that are always stirred up by the fatigue of the journey: not that the rubbing of horses legs is to be disallowed; on the contrary, we highly approve of it, only would not have it done at their first arrival, but when they are perfectly cooled.

Being come to your inn, as soon as your horse is partly dried, and ceases to beat in the flanks, let him be unbridled, his bitt washed, cleansed, and wiped, and let him eat his hay at pleasure.

If your horse be very dry, and you have not given him water on the road, give him oats washed in good mild ale.

The dust and sand will sometimes so dry the tongues and mouths of horses, that they lose their appetites: in such case, give them bran well moistened with water to cool and refresh their mouths; or wash their mouths and tongue with a wet sponge, to oblige them to eat.

The foregoing directions are to be observed after moderate riding; but if you have rode excessively hard, unsaddle your horse, and scrape off the sweat with a sweating-knife, or scraper, holding it with both hands, and going always with the hair; then rub his head and ears with a large hair-cloth, wipe him also between the fore legs and hind legs; in the meanwhile, his body should be rubbed all over with straw, especially under his belly and beneath the saddle, till he is thoroughly dry.

That done, set on the saddle again, cover him; and if you have a warm place, let him be gently led up and down in it for a quarter of an hour; but if not, let him dry where he stands.

Or you may unsaddle him immediately; scrape off the sweat; let the ostler take a little vinegar in his mouth, and squirt it into the horse's; then rub his head, between the fore and hind legs, and his whole body, till he is pretty dry: let him not drink till he is thoroughly cool, and has eaten a few oats; for many, by drinking too soon, have been spoiled. Set the saddle in the sun or by a fire, in order to dry the pannels.

When horses are arrived at an inn, a man should, before they are unbridled, lift up their feet, to see whether they want any of their shoes, or if those they have do not rest upon their sides; afterwards he should pick and clear them of the earth and gravel which may be got betwixt their shoes and soles.

If you water them abroad, upon their return from the river cause their feet to be stopped with cow-dung, which will ease the pain therein; and if it be in the evening, let the dung continue in their feet all night, to keep them soft and in good condition; but if your horse have brittle feet, it will be requisite to anoint the fore feet, at the on-setting of the hoofs, with butter, oil, or hog's grease, before you water him in the morning, and in dry weather they should be also greased at noon.

Many horses, as soon as unbridled, instead of eating, lay themselves down to rest, by reason of the great pain they have in their feet, so that a man is apt to think them sick: but if he looks to their eyes, he will see they are lively and good; and if he offers them meat as they are lying, they will eat it very willingly; yet if he handles their feet, he will find them extremely hot, which discovers their suffering in that part. You must therefore see if their shoes do not rest upon their soles, which is somewhat difficult to be certainly known without unshoeing them; but if you take off their shoes, then look to the inside of them, and you may perceive that those parts which rest upon the soles are more smooth and shining than the others; in this case you are to pare their feet in those parts, and fix on their shoes again, anointing the hoofs, and stopping the soles with scalding hot black pitch or tar.

After a long day's journey, at night feel your horse's back, if he be pinched, galled, or swelled (if you do not immediately discover it, perhaps you may after supper), there is nothing better than to rub it with good brandy and the white of an egg. If the galls are between the legs, use the same remedy; but if the ostler rubs him well between the legs, he will seldom be galled in that part.

In order to preserve horses after travel, take these few useful instructions. When you are arrived from a journey, immediately draw the two heel-nails of the fore feet; and, if it be a large shoe, then four: two or three days after, you may blood him in the neck, and

Horse.

and feed him for 10 or 12 days only with wet bran, without giving him any oats; but keep him well littered.

The reaſon why you are to draw the heel-nails, is becauſe the heels are apt to ſwell, and if they are not thus eaſed, the ſhoes would preſs and ſtraiten them too much: it is alſo adviſable to ſtop them with cow-dung for a while: but do not take the ſhoes off, nor pare the feet, becauſe the humours are drawn down by that means.

The following bath will be very ſerviceable for preſerving your horſe's legs. Take the dung of a cow or ox, and make it thin with vinegar, ſo as to be of the conſiſtence of thick broth; and having added a handful of ſmall ſalt, rub his fore legs from the knees, and the hind legs from the gambrels, chafing them well with and againſt the hair, that the remedy may ſink in and ſtick to thoſe parts, that they may be all covered over with it. Thus leave the horſe till morning, not wetting his legs, but giving him his water that evening in a pail: next morning lead him to the river, or waſh his legs in well water, which is very good, and will keep them from ſwelling.

Thoſe perſons, who, to recover their horſes feet, make a hole in them, which they fill with moiſtened cow dung, and keep it in their fore feet during the ſpace of a month, do very ill; becauſe, though the continual moiſture that iſſues from the dung occaſions the growing of the hoof, yet it dries and ſhrinks it ſo exceſſively when out of that place, that it ſplits and breaks like glaſs, and the foot immediately ſtraitens. For it is certain, that cow-dung (contrary to the opinion of many people) ſpoils a horſe's hoof: it does indeed moiſten the ſole, but it dries up the hoof, which is of a different nature from it. In order, therefore, to recover a horſe's feet, inſtead of cow-dung, fill a hole with blue wet clay, and make him keep his fore-feet in it for a month.

Moſt horſes that are fatigued or over-rid, and made lean by long journeys, have their flanks altered without being purſy, eſpecially vigorous horſes that have worked too violently.

There is no method better to recover them, than to give each of them in the morning half a pound of honey very well mingled with ſcalded bran; and when they readily eat the half pound, give them the next time a whole one, and afterwards two pounds, every day, continuing this courſe till your horſes are empty, and purge kindly with it; but as ſoon as you perceive that their purging ceaſes, forbear to give them any more honey.

You may adminiſter powder of liquorice in the ſcalded bran for a conſiderable time; and to cool their blood, it will not be improper to let them have three or four glyſters.

In caſe the horſe be very lean, it is expedient to give him ſome wet bran, over and above his proportion of oats; and graſs is alſo extraordinary beneficial, if he be not purſy.

If it be a mare, put her to a horſe; and if ſhe never had a foal before, it will enlarge her belly.

Sometimes exceſſive feeding may do horſes more harm than good, by rendering them ſubject to the farcy. You ſhould therefore be cautious in giving them too great a quantity at a time, and take a little blood from them now and then.

Horſe.

When a horſe begins to drink water heartily, it is a certain ſign that he will recover in a ſhort time. As to the method of giving him water during a journey, obſerve the following rules:

All the while you are upon a journey, let your horſe drink of the firſt good water you come to, after ſeven o'clock in the morning if it be in ſummer-time, and after nine or ten in winter.

That is accounted good water which is neither too quick and piercing, nor too muddy and ſtinking.

This is to be done, unleſs you would have him gallop a long time after drinking; for if ſo, you muſt forbear.

Though it is the cuſtom in England to run and gallop horſes after drinking, which we call *watering-courſes*, to bring them (as they ſay) into wind; yet ſays M. de Solleyſel, it is the moſt pernicious practice that can be imagined for horſes, by which many are rendered purſy.

While a horſe is drinking, draw up his head five or ſix times, making him move a little between every draught; and notwithſtanding he be warm, and ſweat very much, yet if he is not quite out of breath, and you have ſtill four or five miles to ride, he will be better after drinking a little, than if he had drank none at all: it is true, indeed, that if the horſe is very warm, you ſhould, at coming out of the water, redouble your pace, to make him go at a gentle trot, to warm the water in his belly.

You ought to let him drink after this manner during the whole time of your journey; becauſe, if when you happen to bait he be hot or ſweaty, you muſt not let him drink for a long time, as it would endanger his life; and when his bridle is taken off, his exceſſive thirſt will hinder him from eating, ſo that he will not offer to touch his meat for an hour or two, which perhaps your occaſion will not allow you for a baiting time, and not to have any food will render him unfit for travel.

If you meet with any ford before you come to your inn, ride the horſe through it two or three times, but not up to his belly: this will not only cleanſe his legs; but the coldneſs of the water will bind up the humours, and prevent them from deſcending.

If your horſe has been very warm, and you have not had the conveniency of watering him upon the road, he will, when unbridled, eat but very little; therefore he ſhould have his oats given him waſhed in ale or beer, or only ſome of them, if you intend to feed him again after he has drank.

Some are of opinion, that horſes are often ſpoiled by giving them oats before their water; becauſe they ſay the water makes the oats paſs too ſoon, and out of the ſtomach undigeſted. But M. de Solleyſel affirms, that though it be the common cuſtom not to do it till after, yet it is proper to feed with oats both before and after, eſpecially if the horſe be warm, and has been hard rode; for he will be a great deal the better for it, and in no danger of becoming ſick.

Buffon's Nat. Hiſt.

Breeding of Horses. When the ſtallion is choſen, and all the mares intended for him are collected together, there muſt be another ſtone horſe, to diſcover which

Horse. which of the mares are in heat, and, at the same time, contribute to inflame them. All the mares are to be brought successively to this stone-horse, which should also be inflamed, and suffered frequently to neigh. As he is for leaping every one, such as are not in heat keep him off, whilst those which are so suffer him to approach them. But instead of being allowed to satisfy his impulse, he must be led away, and the real stallion substituted in his stead. This trial is necessary for ascertaining the true time of the mare's heat, especially of those which have not yet had a colt; for with regard to such as have recently foaled, the heat usually begins nine days after their delivery; and on that very day they may be led to the stallion to be covered; and nine days after, by the experiment above-mentioned, it may be known whether they are still in heat. If they are, they must be covered a second time; and thus successively every ninth day while their heat continues: for when they are impregnated, their heat abates, and in a few days ceases entirely.

But that every thing may be done easily and conveniently, and at the same time with success and advantage, great attention, expence, and precaution, are requisite. The stud must be fixed in a good soil, and in a suitable place, proportioned to the number of mares and stallions intended to be used. This spot must be divided into several parts, inclosed with rails or ditches well fenced; in the part where the pasture is the richest, the mares in fold, and those with colts by their sides, are to be kept. Those which are not impregnated, or have not yet been covered, are to be separated, and kept with the fillies in another close, where the pasture is less rich, that they may not grow too fat, which would obstruct the progress of generation. Lastly, the young stone colts or geldings are to be kept in the driest part of the fields, and where the ground is most unequal; that by running over the uneven surface, they may acquire a freedom in the motion of their legs and shoulders. This close, where the stone colts are kept, must be very carefully separated from the others, lest the young horses break their bounds, and enervate themselves with the mares. If the tract be so large as to allow of dividing each of these closes into two parts, for putting oxen and horses into them alternately, the pasture will last much longer than if continually eaten by horses: the ox improving the fertility, whereas the horse lessens it. In each of these closes should be a pond; standing water being better than running, which often gripes them; and if there are any trees in the ground, they should be left standing, their shade being very agreeable to the horses in great heats; but all stems or stumps should be grubbed up, and all holes levelled, to prevent accidents. In these pastures your horses should feed during the summer; but in the winter the mares should be kept in the stable and fed with hay. The colts also must be housed, and never suffered to feed abroad in winter, except in very fine weather. Stallions that stand in the stable should be fed more with straw than hay; and moderately exercised till covering time, which generally lasts from the beginning of April to the end of June. But during this season they should have no other exercise, and be plentifully fed, but with the same food as usual. Before the stallion is brought to the mare, he should be dressed, as that will greatly increase his ardour. The mare must also be curried, and have no shoes on her hind feet, some of them being ticklish, and will kick the stallion. A person holds the mare by the halter, and two others lead the stallion by long reins; when he is in a proper situation, another assistant carefully directs the yard, pulling aside the mare's tail, as a single hair might hurt him dangerously. It sometimes happens that the stallion does not complete the work of generation, coming from the mare without making any injection; it should therefore be attentively observed, whether, in the last moments of the copulation the dock of the stallion's tail has a vibrating motion; for such a motion always accompanies the emission of the seminal lymph. If he has performed the act, he must on no consideration be suffered to repeat it; but be led away directly to the stable, and there kept two days. For, however able a good stallion may be of covering every day during the three months, it is much better to let him be led to a mare only every other day: his produce will be greater, and he himself less exhausted. During the first seven days, let four different mares be successively brought to him; and the ninth day let the first be again brought, and so successively while they continue in heat; but as soon as the heat of any one is over, a fresh mare is to be put in her place, and covered in her turn every nine days; and as several retain even at the first, second, or third time, it is computed that a stallion, by such management, may, during the three months, cover 15 or 18 mares, and beget 10 or 12 colts. These animals have a very large quantity of the seminal lymph; so that a considerable portion of it is shed during the emission. In the mares likewise is an emission, or rather distillation of the seminal lymph, during the whole time they are horsing; ejecting a viscid whitish lymph, called the *heats*, which ceases on conception. This ichor the Greeks called *hippomanes*; and pretended that philtres might be made of it, one remarkable effect of which was, to render a horse frantic with lust. This hippomanes is very different from that found in the secundines of the foal, which M. Daubenton first discovered, and has so accurately described its nature, origin, and situation. The ejection of this liquor is the most certain sign of the mare's heat; but it is also known by the inflation of the lower part of the vulva, by her frequent neighings, and attempts to get to the horses. After being covered, nothing more is requisite than to lead her away to the field. The first foal of a mare is never so strongly formed as the succeeding; so that care should be taken to procure for her, the first time, a larger stallion, that the defect of the growth may be compensated by the largeness of the size. Particular regard should also be had to the difference or congruity of the fashion of the stallion and the mare, in order to correct the faults of the one by the perfections of the other: especially never to make any disproportionate copulations, as of a small horse with a large mare, or a large horse with a small mare; as the produce of such copulation would be small, or badly proportioned. It is by gradations that we must endeavour to arrive at natural beauty; for instance, to give to a mare a little too clumsy, a well-made horse and finely shaped; to a small mare, a horse a little a little higher; to a mare which is faulty in her fore-hand, a horfe with an elegant head and noble cheft, &c.

It has been obferved, that horfes fed in dry and light grounds, produce temperate, fwift, and vigorous foals, with mufcular legs and a hard hoof; while the fame bred in marfhes and moift paftures have produced foals with a large heavy head, a thick carcafe, clumfy legs, bad hoofs, and broad feet. Thefe differences proceed from the air and food, which is eafily underftood; but what is more difficult to be accounted for, and ftill more effential than what we have hitherto obferved, is, to be continually croffing the breed to prevent a degeneracy.

In coupling of horfes, the colour and fize fhould be fuited to each other, the fhape contrafted, and the breed croffed by an oppofition of climates; but horfes and mares foaled in the fame ftud fhould never be joined. Thefe are effential articles, but there are others which fhould by no means be neglected: as that no fhort-docked mares be fuffered in a ftud, becaufe from their being unable to keep off the flies, they are much more tormented by them than others which have a long fweeping tail; and their continual agitation from the ftings of thefe infects occafions a diminution in the quantity of their milk, and has a great influence on the conftitution and fize of the colt, which will be vigorous in proportion as its dam is a good nurfe. Care muft alfo be taken, that the ftud mares be fuch as have been always brought up in paftures, and never over-worked. Mares which have always been brought up in the ftable on dry food, and afterwards turned to grafs, do not breed at firft: fome time is required for accuftoming them to this new aliment.

Though the ufual feafon for the heat of mares be from the beginning of April to the end of June, yet it is not uncommon to find fome among a large number that are in heat before that time: but it is advifable to let this heat pafs over without giving them to the ftallion, becaufe they would foal in winter; and the colts, befides the inclemency of the feafon, would have bad milk for their nourifhment. Again, if the mares are not in heat till after the end of June, they fhould not be covered that feafon; becaufe the colts being foaled in fummer, have not time for acquiring ftrength fufficient to repel the injuries of the following winter.

Many, inftead of bringing the ftallion to the mare, turn him loofe into the clofe, where all the mares are brought together; and there leave him to choofe fuch as will ftand to him. This is a very advantageous method for the mares: they will always take horfe more certainly than in the other; but the ftallion, in fix weeks, will do himfelf more damage than in feveral years by moderate exercife, conducted in the manner we have already mentioned.

When the mares are pregnant, and their belly begins to fwell, they muft be feparated from thofe that are not, left they hurt them. They ufually go 11 months and fome days, and foal ftanding, whereas moft other quadrupeds lie down. Thofe that cannot foal without great difficulty, muft be affifted; the foal muft be placed in a proper fituation; and fometimes, if dead, drawn out with cords. The head of the colt ufually prefents itfelf firft, as in all other animals: at its coming out of the matrix, it breaks the fecundines or integuments that inclofe it, which is accompanied with a great flux of the lymph contained in them; and at the fame time one or more folid lumps are difcharged, formed by the fediment of the infpiffated liquor of the allantoides. This lump, which the ancients called the *hippomanes of the colt*, is fo far from being, as they imagined, a mafs of flefh adhering to the head of the colt, that it is feparated from it by a membrane called *amnios*. As foon as the colt is fallen, the mare licks it, but without touching the hippomanes, which points out another error of the ancients, who affirmed that fhe inftantly devours it.

The general cuftom is to have a mare covered nine days after her foaling, that no time may be loft; but it is certain, that the mare having, by this means, both her prefent and future foal to nourifh, her ability is divided, and fhe cannot fupply both fo largely as fhe might one only. It would therefore be better, in order to have excellent horfes, to let the mares be covered only every other year; they would laft the longer, and bring foals more certainly; for, in common ftuds, it is fo far from being true that all mares which have been covered bring colts every year, that it is confidered as a fortunate circumftance if half or at moft two thirds of them foal.

Mares, when pregnant, will admit of copulation; but it is never attended with any fuperfœtation. They ufually breed till they are 14 or 15 years of age; and the moft vigorous till they are above 18. Stallions, when well managed, will engender till the age of 20, and even beyond; but it muft be obferved, that fuch horfes as are fooneft made ftallions, are alfo the fooneft incapable of generation: thus the large horfes, which acquire ftrength fooner than the flender, and are therefore often ufed as ftallions as foon as they are four years old, are incapable of generation after they are fixteen.

Gelding of Horses. See Castration, Farriery *Index*.

Draught-Horse, in farming, a fort of coarfe-made horfe deftined for the fervice of the cart or plough. In the choice of thefe horfes for what is called the *flow draught*, they are to be chofen of an ordinary height; for otherwife, when put into the cart, one draws unequally with the other. The draught-horfe fhould be large bodied and ftrong loined, and of fuch a difpofition, as rather to be too dull than too brifk, and rather to crave the whip than to draw more than is needful. Mares are the fitteft for this ufe for the farmer, as they will be kept cheap, and not only do the work, but be kept breeding, and give a yearly increafe of a foal. They fhould have a good head, neck, breaft, and fhoulders; for the reft of the fhape, it is not of much confequence. Only, for breeding, the mare fhould have a large belly; for the more room a foal has in the dam, the better proportioned it will be. Draught-horfes fhould be always kept to that employ. Some put them to the faddle on occafion, but it does them great harm, alters their pace, and fpoils them for labour. The draught horfe ought to have a large broad head, becaufe horfes of this fhaped head are lefs fubject than others to difeafes of the eyes. The ears fhould be

fmall,

Horſe.

ſmall, ſtraight and upright; the noſtrils large and open, that he may breathe with the more freedom. A horſe with a full and bold eye always promiſes well. On the other hand, a ſunk eye, and an elevated brow are bad ſigns. The horſe is eſteemed fitteſt for this purpoſe alſo, that has a large and round buttock, which neither ſinks down nor cuts. He muſt have a firm and ſtrong tail, and the dock muſt be thick and well furniſhed with hair, and placed neither very high nor very low. The legs ſhould be rather flat and broad than round; the roundneſs of the leg being a fault in a horſe deſtined to labour that will ſoon ruin him. As to the hinder legs, the thighs ſhould be fleſhy and long, and the whole muſcle which ſhows itſelf on the outſide of the thigh ſhould be large and very thick. No country can bring a parallel to the ſize and ſtrength of our horſes deſtined for the draught. In London there are inſtances of ſingle horſes that are able to draw on a plain, for a ſmall ſpace, the weight of three tons, and which can with eaſe, and for continuance, draw half that weight. The pack-horſes of Yorkſhire uſually carry a burden of 420lb. over the higheſt hills of the north, as well as the moſt level roads: but the moſt remarkable proof of the ſtrength of our Britiſh horſes is derived from that of our mill horſes; ſome of which will at one load carry 13 meaſures, which at a moderate computation of 70 lb. each, will amount to 910 lb. Nothing is ſo eſſential to the health of theſe ſerviceable creatures as cleanlineſs; if they are fed ever ſo well, and not kept clean, they will be ſubject to numerous diſeaſes.

The ſervant who has the care of them ought to be up very early, and to clean the racks and mangers from all filth. The currying of them ought to be carefully performed every morning, but not in the ſtable, for the duſt to fall upon the other horſes, as it is too often done. After the horſes are duſted, they ſhould daily twiſt a whiſp of ſtraw hard up, and wetting it in water, rub the legs, ſhoulders, and body with it. Many of the diſeaſes of draught-houſes, which are not owing to naſtineſs, are owing to bad water; ſuch as is too raw, too muddy, or too cold, being improper. If there be any running ſtream in the neighbourhood, they ſhould always be led to that to water every day in ſummer; but in winter, well-water is warmiſh, and is better for them. If there be a neceſſity of giving them well-water in ſummer, it muſt be drawn up ſome hours before the time, and expoſed to the ſunbeams in tubs or troughs; marſh-water or that of lowland ditches is worſt of all. When the labouring horſe has drunk his water, he ſhould have his oats given him, and theſe ſhould be carefully ſifted, and the manger duſted firſt. It is a common practice, as ſoon as a horſe is come in from his work, to rub down his legs with a hard whiſp of hay; but the beſt judges of horſes abſolutely condemn this, and obſerve, that this rubbing of the legs after hard labour brings down humours into them, and makes them ſtiff.

The rubbing itſelf is wholeſome, but the doing it when the creature is hot is the miſchief; while a horſe is in a ſweat it is a great relief and refreſhment to him to have his body rubbed down, but when he is cold is the proper time to rub his legs. The racks are to be well ſupplied with hay, and the horſes ſhould be left to reſt and eat, about two hours, and then led to water; after this their oats ſhould be given them, and they ſhould then go to work again.

Horſe.

In the evening, when the labour of the day is over, the firſt thing to be done is to examine the feet, and ſee if any thing is amiſs about the ſhoes; and what earth or gravel is lodged in the foot, between the ſhoe and the ſole, is to be picked out and ſome freſh cow-dung put in its place, which will cool and refreſh the part.

A very material thing for the preſervation of all ſorts of cattle, but of none ſo much as draught-horſes, is freſh and clean litter.

Horse-Cheſnut. See ÆSCULUS, BOTANY *Index.*

Horse-Guards. See GUARDS.

Horse-Hunting. See HUNTER.

Horse-Meaſure is a rod of box to ſlide out of a cane, with a ſquare at the end, being divided into hands and inches to meaſure the height of horſes.

Horse-Muſcle. See MYTILUS, CONCHOLOGY *Index.*

Race-Horse. See RACING.

Horse-Radiſh. See COCHLEARIA, BOTANY *Index.*

Horse-Shoe, a cover or defence for the ſole of a horſe's foot. See FARRIERY *Index.*

Horse-ſhoe-head, a diſeaſe in infants, wherein the ſutures of the ſkull are too open, or too great a vacuity is left between them; ſo that the aperture ſhall not be totally cloſed up, or the cranium in that part not be ſo hard as the reſt for ſome years after. This openneſs is found to be increaſed upon the child's catching cold. When the diſeaſe continues long, it is reputed a ſign of weakneſs and ſhort life. In this caſe, it is uſual to rub the head now and then with warm rum or brandy, mixed with the white of an egg and palm-oil. Sometimes the diſorder ariſes from a collection of waters in the head called an *hydrocephalus.*

Stone-Horse. See STALLION.

Horse-Tail. See EQUISETUM, BOTANY *Index.*

Horse-Vetch. See HIPPOCREPIS, BOTANY *Index.*

War-Horse. The proper rules for chooſing a horſe for ſervice in war, are theſe: he ſhould be tall in ſtature, with a comely head, and out-ſwelling forehead. His eye ſhould be bright and ſparkling, and the white part of it covered by the eye-brow. The ears ſhould be ſmall, thin, ſhort, and pricking; or if long, they ſhould be moveable with eaſe, and well carried. The neck ſhould be deep, and the breaſt large and ſwelling; the ribs bending, the chine broad and ſtraight, and the buttocks round and full. The tail ſhould be high and broad, neither too thick nor too thin; the thigh ſwelling; the leg broad and flat, and the paſtern ſhort. When ſuch a horſe is choſen, he muſt be kept high during the time of his teaching, that he may be full of vigour. His food muſt be ſweet hay, and good clean oats, or two parts of oats and one part of beans or peaſe, well dried and hardened. The quantity ſhould be half a peck in the morning, and the ſame quantity at noon and in the evening. Upon his reſting days he is to be dreſſed between five and ſix in the morning, and watered at ſeven or eight. In the evening he is to be dreſſed at four, and watered about five, and he muſt always have provender given him after watering; he muſt be littered about eight, and then muſt have food given him for all night. The night before he is ridden, all

all his hay is to be taken away about nine o'clock, and he muſt have a handful or two of oats about four in the morning; when he has eaten theſe, he is to be turned upon the ſnaffle, and rubbed very well with dry cloths; then ſaddled, and made fit for his exerciſe. When he has performed this, he is to be brought ſweating into the ſtable, and rubbed down with dry whiſps. When this has been done, the ſaddle is to be taken off, and he is to be rubbed down with dry cloths; the houſing cloth is then to be laid on; and the ſaddle being again laid on, he is to be walked gently about till thoroughly cool. After this, he muſt ſtand without meat two or three hours, then he muſt be fed; and in the afternoon he is to be rubbed and dreſſed as before, and watered in the uſual manner.

Horse-Worm, in *Natural Hiſtory*, a ſpecies of fly-worm called alſo *bott*, produced of eggs depoſited by a two-winged fly of the ſhape and ſize of the humble bee in the inteſtines of horſes. See Botts, Farriery *Index*.

River-Horse. See Hippopotamus, Mammalia *Index*.

Horse is alſo uſed in the military language, to expreſs the cavalry; or the body of ſoldiers who ſerve on horſeback.

The horſe includes horſe guards, horſe grenadiers, and troopers. Dragoons are alſo frequently comprehended under this name, though they fight on foot: of theſe there are now 18 regiments; beſides three regiments of dragoon-guards raiſed in 1685. See Granadier, Dragoons, and Guards.

Maſter of the Horse. See Master.

Light-Horse, are regiments of cavalry, mounted on light ſwift horſes, whoſe men are ſmall and lightly accoutred. They were firſt raiſed in 1757. The denomination aroſe hence, that anciently they were lightly armed, in compariſon of the royal guards, which were armed at all points.

Hungarian Horse. See Hussars.

Horse is alſo a term uſed in various arts and manufactories, for ſomething that helps to ſuſtain their work from the ground, for the more commodious working at it.

The horſe uſed by tanners and ſkinners, alſo called the *leg*, is a piece of wood cut hollow and roundiſh, four or five feet long, and placed aſlope; upon which they pare their ſkins to get off the dirt, hair, fleſh, &c.

Horse is alſo uſed in carpentry, for a piece of wood jointed acroſs two other perpendicular ones, to ſuſtain the boards, planks, &c. which make bridges over ſmall rivers; and on divers other occaſions.

Horse, in ſea-language, is the name of a rope reaching from the middle of a yard to its extremity, or what is called the *yard-arm*, and depending about two or three feet under the yard, for the ſailors to tread upon whilſt they are looſing, reefing, or furling the ſails, rigging out the ſtudding-ſail booms, &c. In order, therefore, to keep the horſe more parallel to the yard, it is uſually ſuſpended to it at proper diſtances, by certain ropes called ſtirrups, which hang about two feet under the yard, having an eye in their lower ends through which the horſe paſſes.

Horse is alſo a thick rope, extended in a perpendicular direction near the fore or after-ſide of a maſt, for the purpoſe of hoiſting or extending ſome ſail upon it. When it is fixed before a maſt, it is calculated for the uſe of a ſail called the *ſquare-ſail*, whoſe yard being attached to the horſe, by means of a traveller, or bull's eye, which ſlides up and down occaſionally, is retained in a ſteady poſition, either when the ſail is ſet, or whilſt it is hoiſting or lowering. When the horſe is placed abaft or behind a maſt, it is intended for the try-ſail of a ſnow, and is accordingly very rarely fixed in this poſition, except in thoſe ſloops of war which occaſionally aſſume the form of ſnows, in order to deceive the enemy.

Horse is alſo a cant name introduced into the management of lotteries, for the chance or benefit of a ticket or number for one or more days, upon condition, if it be drawn a prize within the time covenanted for, of returning to the ſeller an undrawn ticket.—To determine the value of a horſe; multiply the amount of the prizes in the lottery by the time the horſe is hired for; and from the product ſubtract the amount of the number of prizes by the value of an undrawn ticket into the time of the horſe: the remainder being divided by the number of tickets into the whole time of drawing, the quotient is the value of the horſe. See Lottery.

Horse-Bread. See Bread.

Horse-Dung, in *Gardening*, is of great uſe in making hot beds, for the raiſing all ſorts of early crops: as ſalading, cucumbers, melons, aſparagus, &c. for which purpoſes no other kind of dung will do ſo well. Horſe dung ferments the ſtrongeſt; and if mixed with litter and ſea-coal aſhes in a due proportion, will continue its heat much longer than any other ſort of dung whatſoever; and afterward, when rotted, becomes an excellent manure for moſt ſorts of land: more eſpecially for ſuch as are of a cold nature. For ſtiff clayey land, horſe dung mixed with ſea-coal aſhes, and the cleanſing of ſtreets, will cauſe the parts to ſeparate much ſooner than any other compoſt: ſo that where it can be obtained in plenty, it is always to be recommended for ſuch lands. See Dung.

Animated Horse-Hairs, a term uſed to expreſs a ſort of long and ſlender water-worm, of a blackiſh colour, and ſo much reſembling a horſe-hair, that it is generally by the vulgar ſuppoſed to be the hair fallen from a horſe's mane into the water as he drinks, and there animated by ſome ſtrange power. Dr Liſter has at large confuted this abſurd opinion, in the Philoſophical Tranſactions.

Horse-Hair Worms. See Amphisbæna.

Horse-Hoeing Huſbandry. See Agriculture, N° 489.

HORSEMANSHIP;

Or, The Art of Riding, and of Training and Managing, Horses.

Breaking of Horses.

SECT. I. *The Method of preparing Horses to be mounted.*

THOUGH all horses are generally bought at an age when they have already been backed, they should be begun and prepared for the rider with the same care, gentleness, and caution, as if they had never been handled or backed, in order to prevent accidents, which might else arise from skittishness or other causes: and as it is proper that they should be taught the figure of the ground they are to go upon when they are at first mounted, they should be previously trotted in a *longe* on circles, without any one upon them.

Earl of Pembroke's Directions. The manner of doing this is as follows: Put an easy *cavesson* upon the horse's nose, and make him go forwards round you, standing quiet and holding the *longe;* and let another man, if you find it necessary, follow him with a whip. All this must be done very gently, and but a little at a time: for more horses are spoiled by overmuch work, than by any other treatment whatever; and that by very contrary effects: for sometimes it drives them into vice, madness, and despair, and often stupifies and totally dispirits them.

The first obedience required in a horse is going forwards; till he perform this duty freely, never even think of making him rein back, which would inevitably make him restive: as soon as he goes forwards readily, stop and caress him. You must remember in this, and likewise in every other exercise, to use him to go equally well to the right and left; and when he obeys, caress him and dismiss him immediately. If a horse that is very young takes fright and stands still, lead on another horse before him, which probably will induce him instantly to follow. Put a snaffle in his mouth; and when he goes freely, saddle him, girting him at first very loose. Let the cord, which you hold, be long and loose; but not so much so as to endanger the horse's entangling his legs in it. It must be observed, that small circles, in the beginning, would constrain the horse too much, and put him upon defending himself. No bend must be required at first; never suffer him to gallop false; but whenever he attempts it, stop him without delay, and then set him off afresh. If he gallops of his own accord, and true, permit him to continue it; but if he does it not voluntarily, do not demand it of him at first. Should he fly and jump, shake the cord gently upon his nose without jerking it, and he will fall into his trot again. If he stands still, plunges, or rears, let the man who holds the whip make a noise with it; but never touch him till it be absolutely necessary to make him go on. When you change hands, stop and caress him, and entice him by fair means to come up to you; for by presenting yourself, as some do, on a sudden before horses, and frightening them to the other side, you run a great risk of giving them a shyness. If he keeps his head too low, shake the *cavesson* to make him raise it; and in whatever the horse does, whether he walks, trots, or gallops, let it be a constant rule that the motion be determined, and really such as is intended, without the least shuffling, pacing, or any other irregular gait.

Instructions concerning both Riders and Horses.

SECT. II. *The Method of placing the Rider and rendering him firm on Horseback, with some occasional Instructions for Riders and the Horses.*

IT is necessary that the greatest attention, and the same gentleness that is used in teaching the horses, be observed likewise in teaching the rider, especially at the beginning. Every method and art must be practised to create and preserve, both in man and horse, all possible feeling and sensibility; contrary to the usage of most riding-masters, who seem industriously to labour at abolishing these principles both in the one and the other. As so many essential points depend upon the manner in which a man is at first placed on horseback, it ought to be considered and attended to with the strictest care and exactness.

The absurdity of putting a man, who perhaps has never before been upon a horse, on a rough trotting horse, on which he is obliged to stick with all the force of his arms and legs, is too obvious to need mentioning. This rough work, all at once, is plainly as detrimental at first, as it is excellent afterwards in proper time. No man can be either well or firmly seated on horseback, unless he be master of the balance of his body, quite unconstrained, with a full possession of himself, and at his ease; none of which requisites can he enjoy, if his attention be otherwise engaged; as it must wholly be in a raw, unsuppled, and unprepared lad, who is put at once upon a rough horse; in such a distressful state, he is forced to keep himself on at any rate, by holding to the bridle (at the expence of the sensibility both of his own hand and the horse's mouth), and by clinging with his legs, in danger of his life, and to the certain deprivation of a right feeling in the horse.

The first time a man is put on horseback, it ought to be upon a very gentle one. He never should be made to trot, till he is quite easy in the walk; nor gallop, till he is able to trot properly. The same must be observed in regard to horses; they should never be made to trot till they are obedient, and their mouths are well formed on a walk, nor be made to gallop, till the same be effected on a trot. When he is arrived at such a degree of firmness in his seat, the more he trots, and the more he rides rough horses, the better. This is not only the best method, but also the easiest and the shortest: by it a man is soon made sufficiently

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ciently an horseman for a soldier: but by the other detestable methods that are commonly used, a man, instead of improving, contracts all sorts of bad habits, and rides worse and worse every day; the horse too becomes daily more and more unfit for use. In proceeding according to the manner proposed, a man is rendered firm and easy upon the horse, both his own and the horse's sensibility is preserved, and each in a situation fit to receive and practise all lessons effectually.

Among the various methods that are used of placing people on horseback, few are directed by reason. Before you let the man mount, teach him to know, and always to examine, if the curb be well placed, (that is, when the horse has a bit in his mouth, which at first he should not, but only a snaffle, till the rider is firm in his seat, and the horse also somewhat taught): likewise to know if the nose-band be properly tight; the throat-band loosish; and the mouth-piece neither too high nor too low in the horse's mouth, but rightly put, so as not to wrinkle the skin nor to hang lax; the girts drawn moderately, but not too tight; and the crupper and the breast-plate properly adjusted. A very good and careful hand may venture on a bit at first, and succeed with it full as well as by beginning with a snaffle alone: only colts, indeed, it is better, in all schools whatsoever, to avoid any pressure on the bars just at first, which a curb, though ever so delicately used, must in some degree occasion. When the bridle, &c. have been well looked to, let the man approach the horse gently near the shoulder; then taking the reins and a handful of the main in his left hand, let him put his foot softly in the left stirrup, by pulling it towards him, lest he touch the horse with his toe; then raising himself up, let him rest a moment on it with his body upright, but not stiff; and after that, passing his right leg clear over the saddle without rubbing against any thing, let him seat himself gently down. He must be cautious not to take the reins too short, for fear of making the horse rear, run, or fall back, or throw up his head; but let him hold them of an equal length, neither tight nor slack, and with the little finger betwixt them. It is fit that horses should be accustomed to stand still to be mounted, and not to stir till the rider pleases. All soldiers should be instructed to mount and dismount equally well on both sides, which may be of great use in times of hurry and confusion. Then place the man in his saddle, with his body rather back, and his head held up with ease, without stiffness; seated neither forwards, nor very far backwards; with the breast pushed out a little, and the lower part of the body likewise a little forwards; the thighs and legs turned in without constraint, and the feet in a straight line, neither turned in nor out. By this position, the natural weight of the thighs has a proper and sufficient pressure of itself, and the legs are in readiness to act when called upon; they must hang down easy and naturally; and be so placed, as not to be wriggling about, touching, and tickling, the horse's sides, but always near them in case they should be wanted, as well as the heels.

The body must be carefully kept easy and firm, and without any rocking when in motion; which is a bad habit very easily contracted, especially in galloping. The left elbow must be gently leant against the body, a little forwards; unless it be so rested, the hand cannot be steady, but will always be checking, and consequently have pernicious effects on the horse's mouth. And the hand ought to be of equal height with the elbow; if it were lower, it would constrain and confine the motion of the horse's shoulders; but, as the mouths of horses are different, the place of the hand also must occasionally differ: a leaning, low, heavy, fore-hand, requires a high hand; and a horse that pokes out his nose, a low one. The right-hand arm must be placed in symmetry with the left; only let the right hand be a little more forward or backward, higher or lower, as occasion may require, in order that both hands may be free; both arms must be a little bent at the elbow, to prevent stiffness.

Instructions concerning both Riders and Horses.

A soldier's right hand should be kept unemployed in riding; it carries the sword, which is a sufficient business for it.

There remains one farther observation, that ought not to be omitted, about the hand, that it must be kept clear of the body; i. e. about two inches and a half forwards from it, with the nails turned opposite to the belly, and the wrist a little rounded with ease; a position not less graceful than ready for slackening, tightening, and moving the reins from one side to the other, as may be found necessary.

When the men are well placed, the more rough trotting they have without stirrups the better; but with a strict care always, that their position be preserved very exactly. In all cases, great care must be taken to hinder their clinging with their legs; in short, no sticking by hands or legs is ever to be allowed of at any time. If the motion of the horse be too rough, slacken it, till the rider grows by degrees more firm; and when he is quite firm and easy on his horse in every kind of motion, stirrups may be given him; but he must never leave off trotting often without any.

The stirrups must be neither short nor long; but of such a length, that when the rider, being well placed, puts his feet into them (about one-third of the length of each foot from the point of it), the points may be between two and three inches higher than the heels. The rider must not bear upon his stirrups, but only let the natural weight of his legs rest on them: For if he bears upon them he would be raised above and out of his saddle; which he should never be, except in charging sword in hand, with the body inclined forwards at the very instant of attacking. Spurs may be given as soon as the rider is grown familiar with stirrups; or even long before, if his legs are well placed.

A hand should always be firm, but delicate: a horse's mouth should never be surprised by any sudden transition of it, either from slack to tight, or from tight to slack. Every thing in horsemanship must be effected by degrees, but at the same time with spirit and resolution. The hand which by giving and taking properly, gains its point with the least force, is the best; and the horse's mouth, under this same hand's directions, will also consequently be the best, supposing equal advantages in both from nature. This principle of gentleness should be observed upon all occasions in every branch of horsemanship. Sometimes the right hand may be necessary, upon some trouble-

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ſome horſes, to aſſiſt the left; but the ſeldomer this is done, the better; eſpecially in a ſoldier, who has a ſword to carry, and to make uſe of.

The ſnaffle muſt on all occaſions be uppermoſt; that is to ſay, the reins of it muſt be above thoſe of the bridle, whether the ſnaffle or the bit be uſed ſeparately, or whether they be both uſed together. When the rider knows enough, and the horſe is ſufficiently prepared and ſettled to begin any work towards ſuppling, one rein muſt be ſhortened according to the ſide worked to; but it muſt never be ſo much ſhortened, as to make the whole ſtrength reſt on that rein alone: for, not to mention that the work would be falſe and bad, one ſide of the horſe's mouth would by that means be always deadened; whereas, on the contrary, it ſhould always be kept freſh by its own play, and by the help of the oppoſite rein's acting delicately in a ſomewhat ſmaller degree of tenſion; the joint effect of which produces in a horſe's mouth the proper, gentle, and eaſy, degree of *appui* or bearing.

A coward and a madman make alike bad riders, and are both alike diſcovered and confounded by the ſuperior ſenſe of the creature they are mounted upon, who is equally ſpoilt by both, though in very different ways. The coward, by ſuffering the animal to have his own way, not only confirms him in his bad habits, but creates new ones in him: and the madman, by falſe and violent motions and corrections, drives the horſe, through deſpair, into every bad and vicious trick that rage can ſuggeſt.

It is very requiſite in horſemanſhip, that the hand and legs ſhould act in correſpondence with each other in every thing; the latter always ſubſervient and aſſiſtant to the former. Upon circles, in walking, trotting, or galloping, the outward leg is the only one to be uſed, and that only for a moment at a time, in order to ſet off the horſe true, or put him right if he be falſe; and as ſoon as that is done, it muſt be taken away again immediately: but if the horſe be lazy, or otherwiſe retains himſelf, both legs muſt be uſed and preſſed to his ſides at the ſame time together. The leſs the legs are uſed in general, the better. Very delicate good riders, with horſes they have dreſſed themſelves, will ſcarcely ever want their help. By the term *outward* is underſtood the ſide which is more remote from the centre; and by *inward* is meant the ſide next to the centre. In reining back, the rider ſhould be careful not to uſe his legs, unleſs the horſe backeth on his ſhoulders; in which caſe they muſt be both applied gently at the ſame time, and correſpond with the hand. If the horſe refuſe to back at all, the rider's legs muſt be gently approached, till the horſe lifts up a leg, as if to go forwards; at which time, when that leg is in the air, the rein of the ſame ſide with that leg which is lifted up will eaſily bring that ſame leg backwards, and accordingly oblige the horſe to back; but if the horſe offers to rear, the legs muſt be inſtantly removed away. The inward rein muſt be tighter on circles, ſo that the horſe may bend and look inwards; and the outward one croſſed over a little towards it; and both held in the left hand.

Let the man and horſe begin on very ſlow motions, that they may have time to underſtand and reflect on what is taught them; and in proportion as the effects of the reins are better comprehended, and the manner of working becomes more familiar, the quickneſs of motion muſt be increaſed. Every rider muſt learn to feel, without the help of the eye, when a horſe goes falſe, and remedy the fault accordingly: this is an intelligence, which nothing but practice, application, and attention, can give, in the beginning on ſlow motions. A horſe may not only gallop falſe, but alſo trot and walk falſe. If a horſe gallops falſe, that is to ſay, if going to the right he leads with the left leg, or if going to the left he leads with the right; or in caſe he is diſunited, *i. e.* if he leads with the oppoſite leg behind to that which he leads with before; ſtop him immediately, and put him off again properly. The method of effecting this, is by approaching your outward leg, and putting your hand outwards; ſtill keeping the inward rein the ſhorter, and the horſe's head inwards, if poſſible: and if he ſhould ſtill reſiſt, then bend and pull his head outwards alſo; but replace it again, bent properly inwards, the moment he goes off true. A horſe is ſaid to be diſunited to the right, when going to the right, and conſequently leading with the right leg before, he leads with the left behind; and is ſaid to be diſunited to the left, when going to the left, and conſequently leading with the left leg before, he leads with the right behind. A horſe may at the ſame time be both falſe and diſunited; in correcting both which faults, the ſame method muſt be uſed. He is both falſe and diſunited to the right, when in going to the right he leads with the left leg before, and the right behind; notwithſtanding that hinder leg be with propriety more forward under his belly than the left, becauſe the horſe is working to the right: And he is falſe and diſunited to the left, when in going to the left he leads with the right leg before and the left behind; notwithſtanding, as above, that hinder leg be with propriety more forward under his belly than the right, becauſe the horſe is working to the left.

In teaching men a right ſeat on horſeback, the greateſt attention muſt be given to prevent ſtiffneſs, and ſticking by force in any manner upon any occaſion: ſtiffneſs diſgraces every right work; and ſticking ſerves only to throw a man (when diſplaced) a great diſtance from his horſe by the ſpring he muſt go off with: whereas by a proper equilibrating poſition of the body, and by the natural weight only of the thighs, he cannot but be firm and ſecure in his ſeat.

As the men become more firm, and the horſes more ſupple, it is proper to make the circles leſs; but not too much ſo, for fear of throwing the horſes forwards upon their ſhoulders.

Some horſes, when firſt the bit is put into their mouths, if great care be not taken, will put their heads very low. With ſuch horſes, raiſe your right hand with the *bridoon* in it, and play at the ſame time with the bit in the left hand, giving and taking.

On circles, the rider muſt lean his body inwards; unleſs great attention be given to make him do it, he will be perpetually loſing his ſeat outwards. It is ſcarce poſſible for him to be diſplaced, if he leans his body properly inwards.

Of fuppling Horfes.

Sect. III. *The Method of fuppling Horfes with Men upon them, by the* Epaule en dedans, *&c. with and without a* Longe, *on Circles and on ftraight Lines.*

When a horfe is well prepared and fettled in all his motions, and the rider firm, it will be proper then to proceed on towards a father fuppling and teaching of both.

In fetting out upon this new work, begin by bringing the horfe's head a little more inwards than before, pulling the inward rein gently to you by degrees. When this is done, try to gain a little on the fhoulders, by keeping the inward rein the fhorter, as before, and the outward one croffed over towards the inward one. The intention of thefe operations is this: The inward rein ferves to bring in the head, and procures the bend; whilft the outward one, that is a little croffed, tends to make that bend perpendicular and as it fhould be, that is to fay, to reduce the nofe and the forehead to be in a perpendicular line with each other: it alfo ferves, if put forwards, as well as alfo croffed, to put the horfe forwards, if found neceffary; which is often requifite, many horfes being apt in this and other works rather to lofe their ground backwards than otherwife, when they fhould rather advance; if the nofe were drawn in towards the breaft beyond the perpendicular, it would confine the motion of the fhoulders, and have other bad effects. All other bends, befides what are above fpecified, are falfe. The outward rein, being croffed, not in a forward fenfe, but rather a little backwards, ferves alfo to prevent the outward fhoulder from getting too forwards, and makes it approach the inward one; which facilitates the inward leg's croffing over the outward one, which is the motion that fo admirably fupples the fhoulders. Care muft be taken, that the inward leg pafs over the outward one, without touching it: this inward leg's croffing over muft be helped alfo by the inward rein, which you muft crofs towards and over the outward rein every time the outward leg comes to the ground, in order to lift and help the inward leg over it: at any other time, but juft when the outward leg comes to the ground, it would be wrong to crofs the inward rein, or to attempt to lift up the inward leg by it; nay, it would be demanding an abfolute impoffibility, and lugging about the reins and horfe to no purpofe: becaufe in this cafe, a very great part of the horfe's weight refting then upon that leg, would render fuch an attempt not only fruitlefs, but alfo prejudicial to the fenfibility of the mouth, and probably oblige him to defend himfelf; and, moreover, it would put the horfe under a neceffity of ftraddling before, and alfo of leading with the wrong leg, without being productive of any fuppling motion whatfoever.

When the horfe is thus far familiarly accuftomed to what you have required of him, then proceed to effect by degrees the fame croffing in his hinder legs. By bringing in the fore legs more, you will of courfe engage the hinder ones in the fame work; if they refift, the rider muft bring both reins more inward: and, if neceffary, put back alfo, and approach his inward leg to the horfe; and if the horfe throws out his croup too far, the rider muft bring both reins outwards, and, if abfolutely neceffary, he muft alfo make ufe of his outward leg, in order to replace the horfe properly: obferving that the croup fhould always be confiderably behind the fhoulders, which in all actions muft go firft; and the moment that the horfe obeys, the rider muft put his hand and leg again in their ufual pofition.

Of fuppling Horfes.

Nothing is more ungraceful in itfelf, more detrimental to a man's feat, or more deftructive of the fenfibility of a horfe's fides, than a continual wriggling unfettlednefs in a horfeman's legs, which prevents the horfe from ever going a moment together true, fteady, or determined.

A horfe fhould never be turned, without firft moving a ftep forwards: and when it is doing, the rider muft not lift his elbow, and difplace himfelf; a motion only of the hand from the one fide to the other being fufficient for that purpofe. It muft alfo be a conftant rule, never to fuffer a horfe to be ftopped, mounted, or difmounted, but when he is well placed. The flower the motions are when a man or horfe is taught any thing, the better.

At firft, the figures worked upon muft be great, and afterwards made lefs by degrees, according to the improvement which the man and horfe make; and the cadenced pace alfo, which they work in, muft be accordingly augmented. The changes from one fide to the other muft be in a bold determined trot, and at firft quite ftraight forwards, without demanding any fide-motion on two *piftes*, which is very neceffary to require afterwards when the horfe is fufficiently fuppled. By two *piftes* is meant, when the fore parts and hinder parts do not follow, but defcribe two different lines.

In the beginning, a *longe* is ufed on circles, and alfo on ftraight lines, to help both the rider and the horfe; but afterwards, when they are grown more intelligent, they fhould go alone. At the end of the leffon, rein back; then put the horfe, by a little at a time, forwards, by approaching both legs gently to his fides, and playing with the bridle: if he rears, pufh him out immediately into a full trot. Shaking the *caveffon* on the horfe's nofe, and alfo putting one's felf before him and rather near to him, will generally make him back, though he otherwife refufe to do it: and moreover a flight ufe and approaching of the rider's legs, will fometimes be neceffary in backing, in order to prevent the horfe from doing it too much upon his fhoulders; but the preffure of the legs ought to be very fmall, and taken quite away the moment that he puts himfelf enough upon his haunches. If the horfe does not back upon a ftraight line properly, the rider muft not be permitted to have recourfe immediately to his leg, and fo diftort himfelf by it; but firft try, if croffing over his hand and reins to which every fide may be neceffary, it will not be alone fufficient: which moft frequently it will; if not, then employ the leg.

After a horfe is well prepared and fettled, and goes freely on in all his feveral paces, he ought to be in all his works kept, to a proper degree, upon his haunches, with his hinder legs well placed under him; whereby he will be always pleafant to himfelf and his rider, will be light in hand, and ready to execute whatever may be demanded of him, with facility, vigour, and quicknefs.

The common method that is ufed of forcing a horfe fidewife, Of the Head to the Wall, &c.

sidewise, is a most glaring absurdity, and very hurtful to the animal in its consequences; for instead of suppling him, it obliges him to stiffen and defend himself, and often makes a creature that is naturally benevolent, restive, frightened, and vicious.

For horses, who have very long and high fore-hands, and who poke out their noses, a running snaffle is of excellent use; but for such as bore and keep their heads low, a common one is preferable; though any horse's head indeed may be kept up also with a running one, by the rider's keeping his hands very high and forwards: but whenever either is used alone without a bridle upon horses that carry their heads low and that bore, it must be sawed about from one side to the other.

This lesson of the *epaule en dedans* should be taught to such people as are likely to become useful in helping to teach men and to break horses; and the more of such that can be found the better; none others should ever be suffered upon any occasion to let their horses look any way besides the way they are going. But all horses whatever, as likewise all men who are designed for the teaching others, must go thoroughly and perfectly through this excellent lesson, under the directions of intelligent instructors, and often practise it too afterwards; and when that is done, proceed to and be finished by the lessons of head and tail to the wall.

Sect. IV. *Of the Head to the Wall, and of the Croup to the Wall.*

This lesson should be practised immediately after that of the *epaule en dedans*, in order to place the horse properly the way he goes, &c. The difference between the head to the wall, and the croup to the wall, consists in this: in the former, the fore-parts are more remote from the centre, and go over more ground; in the latter, the hinder parts are more remote from the centre, and consequently go over more ground: in both, as likewise in all other lessons, the shoulders must go first. In riding-horses, the head to the wall is the easier lesson of the two at first, the line to be worked upon being marked by the wall, not far from his head.

The motion of the legs to the right, is the same as that of the *epaule en dedans* to the left, and so *vice versa;* but the head is always bent and turned differently: in the *epaule en dedans*, the horse looks the contrary way to that which he goes; in this, he looks the way he is going.

In the beginning, very little bend must be required: too much at once would astonish the horse, and make him defend himself: it is to be augmented by degrees. If the horse absolutely refuses to obey, it is a sign that either he or his rider has not been sufficiently prepared by previous lessons. It may happen, that weakness or a hurt in some part of the body, or sometimes temper, though seldom, may be the cause of the horse's defending himself: it is the rider's business to find out from whence the obstacle arises; and if he finds it to be from the first mentioned cause, the previous lessons must be resumed again for some time; if from the second, proper remedies must be applied; and if from the last cause, when all fair means that can be tried have failed, proper corrections with coolness and judgement must be used.

In practising this lesson to the right, bend the horse to the right with the right rein; helping the left leg over the right (at the time when the right leg is just come to the ground), with the left rein crossed towards the right, and keeping the right shoulder back with the right rein towards your body, in order to facilitate the left leg's crossing over the right; and so likewise *vice versa* to the left, each rein helping the other by their properly mixed effects. In working to the right, the rider's left leg helps the hinder parts on to the right, and his right leg stops them if they get too forwards; and so *vice versa* to the left: but neither ought to be used, till the hand being employed in a proper manner has failed, or finds that a greater force is necessary to bring about what is required than it can effect alone: for the legs should not only be corresponding with, but also subservient to, the hand; and all unnecessary aids, as well as all force, ought always to be avoided as much as possible.

In the execution of all lessons, the equilibre of the rider's body is of great use to the horse; it ought always to go with and accompany every motion of the animal; when to the right, to the right; and when to the left, to the left.

Upon all horses, in every lesson and action, it must be observed, that there is no horse but has his own peculiar appui or degree of bearing, and also a sensibility of mouth, as likewise a rate of his own, which it is absolutely necessary for the rider to discover and make himself acquainted with. A bad rider always takes off at least the delicacy of both, if not absolutely destroys it. The horse will inform his rider when he has got his proper bearing in the mouth, by playing pleasantly and steadily with his bit, and by the spray about his chaps. A delicate and good hand will not only always preserve a light appui, or bearing, in its sensibility; but also of a heavy one, whether naturally so or acquired, make a light one. The lighter this appui can be made, the better; provided that the rider's hand corresponds with it; if it does not, the more the horse is properly prepared, so much the worse. Instances of this inconvenience of the best of appuis, when the rider is not equally taught with the horse, may be seen every day in some gentlemen, who try to get their horses *bitted* as they call it, without being suitably prepared themselves for riding them: the consequence of which is, that they ride in danger of breaking their necks; till at length, after much hauling about, and by the joint insensibility and ignorance of themselves and their grooms, the poor animals gradually become mere senseless unfeeling posts; and thereby grow, what they call, *settled*. When the proper appui is found, and made of course as light as possible, it must not be kept duly fixed without variation, but be played with; otherwise one equally continued tension of reins would render both the rider's hand and the horse's mouth very dull. The slightest and frequent giving and taking is therefore necessary to keep both perfect.

Whatever pace or degree of quickness you work in, (be

To make Horses stand Fire, &c.

(be it ever so fast, or ever so slow), it must be cadensed; time is as necessary for a horseman as for a musician.

This lesson of the head and of the tail to the wall, must be taught every soldier: scarce any manœuvre can be well performed without it. In closing and opening of files, it is almost every moment wanted.

Sect. V. *The Method of making Horses stand Fire, Noises, Alarms, Sights*, &c.

In order to make horses stand fire, the sound of drums, and all sorts of different noises, you must use them to it by degrees in the stable at feeding time; and instead of being frightened at it, they will soon come to like it as a signal for eating.

With regard to such horses as are afraid of burning objects, begin by keeping them still at a certain distance from some lighted straw; caress the horse; and in proportion as his fright diminishes, approach gradually the burning straw very gently, and increase the size of it. By this means he will very quickly be brought to be so familiar with it, as to walk undaunted even through it.

As to horses that are apt to lie down in the water, if animating them, and attacking them vigorously, should fail of the desired effect, then break a straw-bottle full of water upon their heads, and let the water run into their ears, which is a thing they apprehend very much.

All troop-horses must be taught to stand quiet and still when they are shot off from, to stop the moment you present, and not to move after firing till they are required to do it; this lesson ought especially to be observed in light troops: in short, the horses must be taught to be so cool and undisturbed, as to suffer the rider to act upon him with the same freedom as if he was on foot. Patience, coolness, and temper are the only means requisite for accomplishing this end. Begin by walking the horse gently, then stop and keep him from stirring for some time, so as to accustom him by degrees not to have the least idea of moving without orders: if he does, then back him; and when you stop him, and he is quite still, leave the reins quite loose.

To use a horse to fire-arms, first put a pistol or a carabine in the manger with his feed: then use him to the sound of the lock and the pan; after which, when you are upon him, show the piece to him, presenting it forwards, sometimes on one side, sometimes on the other: when he is thus far reconciled, proceed to flash in the pan; after which, put a small charge into the piece, and so continue augmenting it by degrees to the quantity which is commonly used: if he seems uneasy, walk him forward a few steps slowly; and then stop, back, and caress him. Horses are often also disquieted and unsteady at the clash, and drawing, and returning of swords; all which they must be familiarized to by little and little, by frequency and gentleness.

It is very expedient for all cavalry in general, but particularly for light cavalry, that their horses should be very ready and expert in leaping over ditches, hedges, gates, &c. The leaps, of whatever sort they are, which the horses are brought to in the beginning, ought to be very small ones; the riders must keep their bodies back, raise their hands a little in order to help the fore-parts of the horse up, and be very attentive to their equilibre. It is best to begin at a low bar covered with furze, which pricking the horse's legs, if he does not raise himself sufficiently, prevents his contracting a sluggish and dangerous habit of touching, as he goes over, which any thing yielding and not pricking would give him a custom of doing. Let the ditches you first bring horses to be narrow; and in this, as in every thing else, let the increase be made by degrees. Accustom them to come up to every thing which they are to leap over, and to stand coolly at it for some time; and then to raise themselves gently up in order to form to themselves an idea of the distance. When they leap well standing, then use them to walk gently up to the leap, and to go over it without first halting at it; and after that practice is familiar to them, repeat the like in a gentle trot, and so by degrees faster and faster, till at length it is as familiar to them to leap flying on a full gallop as any other way: all which is to be acquired with great facility by calm and soft means, without any hurry.

Of Reining Back, &c.

As horses are naturally apt to be frightened at the sight and smell of dead horses, it is adviseable to habituate them to walk over and leap over carcases of dead horses: and as they are particularly terrified at this sight, the greater gentleness ought consequently to be used.

Horses should also be accustomed to swim, which often may be necessary upon service; and if the men and horses both are not used to it, both may be frequently liable to perish in the water. A very small portion of strength is sufficient to guide a horse, anywhere indeed, but particularly in the water, where they must be permitted to have their heads, and be no-ways constrained in any shape.

The unreasonable rage in Britain of cutting off all extremities from horses, is in all cases a very pernicious custom. It is particularly so in regard to a troop-horse's tail. It is almost incredible, how much they suffer at the picket for want of it: constantly fretting, and sweating, kicking about and laming one another, tormented, and stung off their meat, miserable, and helpless; while other horses, with their tails on, brush off all flies, are cool and at their ease, and mend daily; whilst the docked ones grow every hour more and more out of condition.

Sect. VI. *The Method of reining back,—and of moving forwards immediately after;—of Piasing,—of Pillars*, &c.

Never finish your work by reining back with horses that have any disposition towards retaining themselves; but always move them forwards, and a little upon the haunches also, after it, before you dismount, (unless they retain themselves very much indeed, in which case nothing at all must be demanded from the haunches). This lesson of reining back, and piasing, is excellent to conclude with, and puts a horse well and properly upon the haunches: It may be done, according as horses are more or less suppled, either going forwards, backing, or in the same place: if it is done well advancing, or at most on the same spot, it is fully sufficient for a soldier's dier's horse: For to piafe in backing, is rather too much to be expected in the hurry which cannot but attend such numbers both of men and horses as must be taught together in regiments. This lesson must never be attempted at all, till horses are very well suppled, and somewhat accustomed to be put together; otherwise it will have very bad consequences, and create restiveness. If they refuse to back, and stand motionless, the rider's legs must approach with the greatest gentleness to the horse's sides; at the same time that the hand is acting on the reins to solicit the horse's backing. This seldom fails of procuring the desired effect, by raising one of the horse's fore-legs, which being in the air, has no weight upon it, and is consequently very easily brought backwards by a small degree of tension in the reins. When this lesson is well performed, it is very noble and useful, and has a pleasing air; it is an excellent one to begin teaching scholars with.

The lesson is particularly serviceable in the pillars, for placing scholars well at first. Very few regimental riding-houses have pillars, and it is fortunate they have not: for though, when properly made use of with skill, they are one of the greatest and best discoveries in horsemanship; they must be allowed to be very dangerous and pernicious, when they are not under the direction of a very knowing person.

Sect. VII. *The Method of curing Restiveness, Vices, Defences, Starting*, &c.

Whenever a horse makes resistance, one ought, before remedy or correction is thought of, to examine very minutely all the tackle about him, if any thing hurts or tickles him, whether he has any natural or accidental weakness, or in short any the least impediment in any part. For want of this precaution, many fatal disasters happen: the poor dumb animal is frequently accused falsely of being restive and vicious; is used ill without reason; and, being forced into despair, is in a manner obliged to act accordingly, be his temper and inclination ever so well disposed. It is very seldom the case, that a horse is really and by nature vicious; but if such be found, he will despise all caresses, and then chastisements become necessary.

Correction, according as you use it, throws a horse into more or less violent action, which, if he be weak, he cannot support: but a vicious strong horse is to be considered in a very different light, being able both to undergo and consequently to profit by all lessons; and is far preferable to the best natured weak one upon earth. Patience and attention are never failing means to reclaim such a horse: in whatsoever manner he defends himself, bring him back frequently with gentleness (not however without having given him proper chastisement if necessary) to the lesson which he seems most averse to. Horses are by degrees made obedient, through the hope of recompense and the fear of punishment: how to mix these two motives judiciously together, it is a very difficult matter; it requires much thought and practice; and not only a good head, but a good heart likewise. The coolest and best natured rider will always succeed best. By a dexterous use of the incitements above-mentioned, you will gradually bring the horse to temper and obedience; mere force, and want of skill and coolness, would only tend to confirm him in bad tricks. If he be impatient or choleric, never strike him, unless he absolutely refuse to go forward; which you must resolutely oblige him to do, and which will be of itself a correction, by preventing his having time to meditate and put in execution any defence by retaining himself. Resistance in horses, you must consider, is sometimes a mark of strength and vigour, and proceeds from spirit, as well as sometimes from vice and weakness. Weakness frequently drives horses into viciousness, when any thing wherein strength is necessary is demanded from them; nay, it inevitably must: great care therefore should always be taken to distinguish from which of these two causes any remedy or punishment is thought of. It may sometimes be a bad sign when horses do not at all defend themselves, and proceed from a sluggish disposition, a want of spirit, and of a proper sensibility. Whenever one is so fortunate as to meet with a horse of just the right spirit, activity, delicacy of feeling, with strength and good nature, he cannot be cherished too much; for such a one is a rare and inestimable jewel, and, if properly treated, will in a manner do every thing of himself. Horses are oftener spoilt by having too much done to them, and by attempts to dress them in too great an hurry, than by any other treatment.

If after a horse has been well suppled, and there are no impediments, either natural or accidental, if he still persist to defend himself, chastisements then become necessary: but whenever this is the case, they must not be frequent but always firm, though always as little violent as possible; for they are both dangerous and very prejudicial when frequently or slightly played with, and still more so when used too violently.

It is impossible, in general, to be too circumspect in lessons of all kinds, in aids, chastisements, or caresses. Some have quicker parts, and more cunning, than others. Many will imperceptibly gain a little every day on the rider. Various, in short, are their dispositions and capacities. It is the rider's business to find out their different qualities, and to make them sensible how much he loves them, and desires to be loved by them; but at the same time that he does not fear them, and will be master.

Plunging is a very common defence among restive and vicious horses: if they do it in the same place, or backing, they must, by the rider's legs and spurs firmly applied, be obliged to go forwards, and their heads kept up high. But if they do it flying forwards, keep them back, and ride them gently and very slow for a good while together. Of all bad tempers and qualities in horses, those which are occasioned by harsh treatment and ignorant riders are the worst.

Rearing is a bad vice, and, in weak horses especially, a very dangerous one. Whilst the horse is up, the rider must yield his hand; and when the horse is descending, he must vigorously determine him forwards: if this be done at any other time but whilst the horse is coming down, it may add a spring to his rearing, and make him fall backwards. With a good hand on them, horses seldom persist in this vice; for they are themselves naturally much afraid of falling

 backwards,

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backwards. If this method fails, you must make the horse kick up behind, by getting somebody on foot to strike him behind with a whip; or, if that will not effect it, by pricking him with a goad.

Starting often proceeds from a defect in the sight; which therefore must be carefully looked into. Whatever the horse is afraid of, bring him up to it gently; if you caress him every step he advances, he will go quite up to it by degrees, and soon grow familiar with all sorts of objects. Nothing but great gentleness can correct this fault; for if you inflict punishment, the apprehension of chastisement becomes prevalent, and causes more starting than the fear of the object. If you let him go by the object, without bringing him up to it, you increase the fault, and confirm him in his fear: the consequence of which is, he takes his rider perhaps a quite contrary way from what he was going, becomes his master, and puts himself and the person upon him every moment in great danger.

With such horses as are to a very great degree fearful of any objects, make a quiet horse, by going before them, gradually entice them to approach nearer and nearer to the thing they are afraid of. If the horse, thus alarmed, be undisciplined and headstrong, he will probably run away with his rider; and if so, his head must be kept up high, and the snaffle sawed backwards and forwards from right to left, taking up and yielding the reins of it, as also the reins of the bit: but this latter must not be sawed backwards and forwards like the snaffle, but only taken up and yielded properly. No man ever yet did, or ever will stop a horse, or gain any one point over him, by main force, or by pulling a dead weight against him.

Sect. VIII. *Rules for bad Horsemen.*

Thomson's Rules.

In the first place, every horse should be accustomed to stand still when he is mounted. One would imagine this might be readily granted; yet we see how much the contrary is practised. When a gentleman mounts at a livery-stable, the groom takes the horse by the bit, which he bends tight round his under jaw: the horse striving to go on, is forced back; advancing again, he frets, as he is again stopped short, and hurt by the manner of holding him. The rider, in the mean time, mounting without the bridle, or at least holding it but slightly, is helped to it by the groom, who being thoroughly employed by the horse's fluttering, has at the same time both bridle and stirrup to give. This confusion would be prevented, if every horse was taught to stand still when he is mounted. Forbid your groom, therefore, when he rides your horse to water, to throw himself over him from a horse-block, and kick him with his leg, even before he is fairly upon him. This wrong manner of mounting is what chiefly teaches your horse the vicious habit against which we are here warning. On the other hand, a constant practice of mounting in the proper manner, is all that is necessary to prevent a horse's going on till the rider is quite adjusted in the saddle.

The next thing necessary therefore is, that the rider should mount properly. The common method is to stand near the croup or hinder part of the horse, with the bridle held very long in the right hand. By this manner of holding the bridle before you mount, you are liable to be kicked; and when you are mounted, your horse may go on some time, or play what gambols he pleases, before the rein is short enough in your hand to prevent him. It is common likewise for an awkward rider, as soon as his foot is in the stirrup, to throw himself with all his force to gain his seat; which he cannot do, till he hath first overbalanced himself on one side or the other: he will then wriggle into it by degrees. The way to mount with ease and safety is, to stand rather before than behind the stirrup. In this posture take the bridle short, and the mane together in your left hand, helping yourself to the stirrup with your right, so that your toe may not touch the horse in mounting. While your left foot is in the stirrup, move on your right, till you face the side of the horse, looking across over the saddle. Then with your right hand grasp the hinder part of the saddle; and with that and your left, which holds the mane and bridle, lift yourself upright on your left foot. Remain thus a mere instant on your stirrup, only so as to divide the action into two motions. While you are in this posture, you have a sure hold with both hands, and are at liberty, either to get safely down, or to throw your leg over and gain your seat. By this deliberate motion, likewise, you avoid, what every good horseman would endeavour to avoid, putting your horse into a flutter.

When you dismount, hold the bridle and mane together in your left hand, as when you mounted; put your right hand on the pommel of the saddle, to raise yourself; throw your leg back over the horse, grasp the hinder part of the saddle with your right hand, remain a moment on your stirrup, and in every respect dismount as you mounted; only what was your first motion when you mounted, becomes the last in dismounting. Remember not to bend your right knee in dismounting, lest your spur should rub against the horse.

It may be next recommended to hold your bridle at a convenient length. Sit square, and let not the purchase of the bridle pull forward your shoulder; but keep your body even, as it would be if each hand held a rein. Hold your reins with the whole grasp of your hand, dividing them with your little finger. Let your hand be perpendicular; your thumb will then be uppermost, and placed on the bridle. Bend your wrist a little outward: and when you pull the bridle, raise your hand toward your breast, and the lower part of the palm rather more than the upper. Let the bridle be at such a length in your hand, as, if the horse should stumble, you may be able to raise his head, and support it by the strength of your arms, and the weight of your body thrown backward. If you hold the rein too long, you are subject to fall backward as your horse rises.

If, knowing your horse perfectly well, you think a tight rein unnecessary, advance your arm a little (but not your shoulder) towards the horse's head, and keep your usual length of rein. By this means, you have a check upon your horse, while you indulge him.

If you ride with a curb, make it a rule to hook on the chain yourself; the most quiet horse may bring his rider into danger, should the curb hurt him. If, in fixing the curb, you turn the chain to the right, the

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the links will unfold themselves, and then oppose a farther turning. Put on the chain loose enough to hang down on the horse's under lip, so that it may not rise and press his jaw, till the reins of the bridle are moderately pulled.

If your horse has been used to stand still when he is mounted, there will be no occasion for a groom to hold him: but if he does, suffer him not to touch the reins, but that part of the bridle which comes down the cheek of the horse. He cannot then interfere with the management of the reins, which belongs to the rider only; and holding a horse by the curb (which is ever painful to him) is evidently improper when he is to stand still.

Another thing to be remembered is, not to ride with your arms and elbows as high as your shoulders; nor let them shake up and down with the motion of the horse. The posture is unbecoming, and the weight of the arms (and of the body too if the rider does not sit still) acts in continual jerks on the jaw of the horse, which must give him pain, and make him unquiet, if he has a tender mouth or any spirit.

Bad riders wonder why horses are gentle as soon as they are mounted by skilful ones, though their skill seems unemployed: the reason is, the horse goes at his ease, yet finds all his motions watched; which he has sagacity enough to discover. Such a rider hides his whip, if he finds his horse is afraid of it; and keeps his legs from his sides, if he finds he dreads the spur.

Avoid the ungraceful custom of letting your legs shake against the sides of the horse: and as you are not to keep your arms and elbows high, and in motion; so you are not to rivet them to your sides, but let them fall easy. One may, at a distance, distinguish a genteel horseman from an awkward one: the first sits still, and appears of a piece with his horse; the latter seems flying off at all points.

It is often said with emphasis, that such a one has no *seat* on horseback; and it means, not only that he does not ride well, but that he does not sit on the right part of the horse. To have a *good seat*, is to sit on that part of the horse, which, as he springs, is the centre of motion; and from which, of course, any weight would be with most difficulty shaken. As in the rising and falling of a board placed in *æquilibrio*, the centre will be always most at rest; the true seat will be found in that part of your saddle, into which your body would naturally slide, if you rode without stirrups: and is only to be preserved by a proper poise of the body, though the generality of riders imagine it is to be done by the grasp of the thighs and knees. The rider should consider himself as united to his horse in this point; and when shaken from it, endeavour to restore the balance.

Perhaps the mention of the two extremes of a bad seat may help to describe the true one. The one is, when the rider sits very far back on the saddle, so that his weight presses the loins of the horse: the other, when his body hangs forward over the pommel of the saddle. The first may be seen practised by grooms, when they ride with their stirrups affectedly short; the latter, by fearful horsemen on the least flutter of the horse. Every *good* rider has, even on the hunting saddle, as *determined* a place for his thighs, as can be determined for him by the bars of a demi-peak. Indeed there is no difference between the seat of either: only, as in the first you ride with shorter stirrups, your body will be consequently more behind your knees.

To have a good seat yourself, your saddle must fit well. To fix a precise rule might be difficult: it may be a *direction*, to have your saddle press as nearly as possible on that part which we have described as the point of union between the man and horse; however, so as not to obstruct the motion of the horse's shoulders. Place yourself in the middle or lowest part of it: sit erect; but with as little constraint as in your ordinary sitting. The ease of action marks the gentleman: you may repose yourself, but not lounge. The set and studied erectness acquired in the riding-house, by those whose deportment is not easy, appears ungenteel and unnatural.

If your horse stops short, or endeavours by rising and kicking to unseat you, bend not your body forward, as many do in these circumstances: that motion throws the breech backward, and you off your fork or twist, and out of your seat; whereas, the advancing the lower part of your body, and bending back the upper part and shoulders, is the method both to keep your seat, and to recover it when lost. The bending your body back, and that in a great degree, is the greatest security in *flying* leaps; it is a security too, when your horse leaps *standing*. The horse's rising does not try the rider's seat; the lash of his hind legs is what ought chiefly to be guarded against, and is best done by the body's being greatly inclined back. Stiffen not your legs or thighs; and let your body be pliable in the loins, like the coachman's on his box. This loose manner of sitting will elude every rough motion of the horse; whereas the fixture of the knees, so commonly laid a stress on, will in great shocks conduce to the violence of the fall.

Was the cricket-player, when the ball is struck with the greatest velocity, to hold his hand firm and fixed when he receives it, the hand would be bruised, or perhaps the bones fractured by the resistance. To obviate this accident, he therefore gradually yields his hand to the motion of the ball for a certain distance; and thus by a due mixture of opposition and obedience, catches it without sustaining the least injury. The case is exactly the same in riding: the skilful horseman will recover his poise by giving some way to the motion; and the ignorant horseman will be flung out of his seat by endeavouring to be fixed.

Stretch not out your legs before you; this will push you against the back of the saddle; neither gather up your knees like a man riding on a pack; this throws your thighs upwards: each practice unseats you. Keep your legs straight down; and sit not on the most fleshy part of the thighs, but turn them inwards, so as to bring in your knees and toes: and it is more safe to ride with the ball of the foot pressing on the stirrup, than with the stirrup as far back as the heel: for the pressure of the heel being in that case behind the stirrup, keeps the thighs down.

When you find your thighs thrown upwards, widen your knees to get them and the upper part of your fork lower down on the horse. Grasp the saddle with the hollow or inner part of your thighs, but not more than

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than just to assist the balance of your body: this will also enable you to keep your spurs from the horse's sides, and to bring your toes in, without that affected and useless manner of bringing them in practised by many. Sink your heels straight down; for while your heels and thighs keep down, you cannot fall: this (aided with the bend of the back) gives the security of a seat, to those who bear themselves up in their stirrups in a swift gallop, or in the alternate rising and falling in a full trot.

Let your seat determine the length of your stirrups, rather than the stirrups your seat. If more precision is requisite, let your stirrups (in the hunting saddle) be of such a length, as that, when you stand in them, there may be the breadth of four fingers between your seat and the saddle.

It would greatly assist a learner, if he would practise riding in a large circle, as directed sect. ii. without stirrups; keeping his face looking on the outward part of the circle so as not to have a full view of the horse's head, but just of that ear which is on the outward part of the circle; and his shoulder, which is towards the centre of the circle, very forward. By this means you learn to balance your body, and keep a true seat, independent of your stirrups: you may probably likewise escape a fall, should you at any time lose them by being accidentally shaken from your seat.

As the seat in some measure depends on the saddle, it may not be amiss to observe, that because a saddle with a high pommel is thought dangerous, the other extreme prevails, and the pommel is scarce allowed to be higher than the middle of the saddle. The saddle should lie as near the back-bone as can be, without hurting the horse; for the nearer you sit to his back, the better seat you have. If it does so, it is plain the pommel must rise enough to secure the withers from pressure: therefore, a horse whose withers are higher than common, requires a higher pommel. If, to avoid this, you make the saddle of a more straight line, the inconvenience spoken of follows; you sit too much above the horse's back, nor can the saddle form a proper seat. There should be no ridge from the button at the side of the pommel, to the back part of the saddle. That line also should be a little concave, for your thighs to lie at ease. In short, a saddle ought to be, as nearly as possible, as if cut out of the horse.

When you want your horse to move forward, raise his head a little, and touch him gently with your whip; or else, press the calves of your legs against his sides. If he does not move fast enough, press them with more force, and so till the spur just touches him. By this practice he will (if he has any spirit) move upon the least pressure of the leg. Never spur him by a kick; but if it be necessary to spur him briskly, keep your heels close to his sides, and slacken their force as he becomes obedient.

When your horse attempts to be vicious, take each rein separate, one in each hand, and advancing your arms forward, hold him very short. In this case, it is common for the rider to pull him hard, with his arms low. But the horse by this means having his head low too, has it more in his power to throw out his heels: whereas, if his head be raised very high, and his nose thrown out a little, which is consequent, he can neither rise before nor behind; because he can give himself neither of those motions, without having his head at liberty. A plank placed in *æquilibrio*, cannot rise at one end unless it sinks at the other.

If your horse is headstrong, pull not with one continued pull, but stop, and back him often, just shaking the reins, and making little repeated pulls till he obeys. Horses are so accustomed to bear on the bit when they go forward, that they are discouraged if the rider will not let them do so.

If a horse is loose-necked, he will throw up his head at a continued pull; in which situation, the rider, seeing the front of his face, can have no power over him. When your horse does thus, drop your hand and give the bridle play, and he will of course drop his head again into its proper place: while it is coming down, make a second gentle pull, and you will find his mouth. With a little practice, this is done almost instantaneously; and this method will stop, in the distance of a few yards, a horse, which will run away with those who pull at him with all their might. Almost every one must have observed, that when a horse feels himself pulled with the bridle, even when he is going gently, he often mistakes what was designed to stop him, as a direction to bear on the bit and to go faster.

Keep your horse's head high, that he may raise his neck and crest; play a little with the rein, and move the bit in his mouth, that he may not press on it in one constant and continued manner: be not afraid of raising his head too high; he will naturally be too ready to bring it down, and tire your arms with its weight, on the least abatement of his mettle. When you feel him heavy, stop him, and make him go back a few paces: thus you break by degrees his propensity to press on his bridle.

You ought not to be pleased (though many are) with a round neck, and a head drawn in towards his breast: let your horse carry his head bridling in, provided he carries it high, and his neck arching upwards; but if his neck bends downwards, his figure is bad, his sight is too near his toes, he leans on the bridle, and you have no command over him. If he goes pressing but lightly on the bridle, he is the more sure-footed, and goes pleasanter; as your wrist only may guide him. If he hangs down his head, and makes you support the weight of that and his neck with your arms bearing on his fore-legs, (which is called *being on his shoulders*), he will strike his toes against the ground, and stumble.

If your horse is heavy upon the bit, tie him every day, for an hour or two, with his tail to the manger, and his head as high as you can make him lift it, by a rein on each post of the stall, tied to each ring of the snaffle bit.

Horse-breakers and grooms have a great propensity to bring a horse's head *down*, and seem to have no seat without a strong hold by the bridle. They know indeed, that the head should yield to the reins, and the neck form an arch; but do not take the proper pains to make it an arch *upward*. A temporary effect of attempting to raise a horse's head, may perhaps be making him push out his nose. They will here tell you, that his head is too high already; whereas it is not the distance from his *nose*, but from the *top* of his head

head to the ground, which determines the head to be high or low. Besides, although the fault is said to be in the manner of carrying the head, it should rather be said to be in that of the neck; for if the neck was raised, the head would be more in the position of one set on a well formed neck.

The design therefore of lifting up the head, is to raise the neck, and *thereby* bring in the head; for even while the bridle makes the same line from the rider's hand to the bit, the horse's nose may be either drawn in, or thrust out, according as his neck is raised or depressed. Instead of what has been here recommended, we usually see colts broke with their heads cavessoned very low, their necks stiff, and not in the least suppled. When the breaking-tackle is left off, and they are mounted for the road, having more food and rest, they frequently plunge, and a second breaking becomes necessary. Then, as few gentlemen can manage their own horses, they are put into the hands of grooms, from whom they learn a variety of bad habits.

If, on the other hand, your horse carries his head (or rather his nose) too high, he generally makes some amends by moving his shoulders lightly, and going safely. Attend to the cause of this fault. Some horses have their necks set so low on their shoulders, that they bend first down, then upwards, like a stag's. Some have the upper line of their necks, from their ears to their withers, too short. A head of this sort cannot possibly bend inwards and form an arch, because the vertebræ (or neck bones) are too short to admit of flexure; for in long and short necked horses the number of the vertebræ is the same. In some, the jaw is so thick, that it meets the neck, and the head by this means has not room to bend. On the other hand, some have the under line from the jaw to the breast so short, that the neck cannot rise.

In all these cases you may gain a *little* by a nice hand with an easy bit; but no curb, martingale, or other forcible method, will *teach* a horse to carry his head or neck in a posture which nature has made uneasy to him. By trying to pull in his nose farther than he can bear, you will add a bad habit to nature. You could not indeed *contrive* a more effectual method to make him continually toss his nose up, and throw his foam over you.

The rule already given to ride a loose-necked horse, will be a proper one for all light-mouthed horses; one caution being added, which is, always to search whether his saddle or girths may not in some way pinch him; and whether the bit may not hurt his lip by being too high in his mouth: because, whenever he frets from either of these causes, his head will not be steady.

It is a common custom to be always pulling at the bridle, as if to set off to advantage either the spirit of the horse, or the skill of the rider. Our horses therefore are taught to hold their heads low, and pull so as to bear up the rider from the saddle standing in his stirrups, even in the gentlest gallop: how very improper is this, we are experimentally convinced, when we happen to meet with a horse which gallops otherwise. We immediately say, *he canters excellently*, and find the ease and pleasure of his motion. When horses are designed for the race, and swiftness is the only thing considered, the method may be a good one.

It is not to be wondered that *dealers* are always pulling at their horses, that they have the spur constantly in their sides, and are at the same time continually checking the rein: by this means they make them bound, and champ the bit, while their rage has the appearance of spirit. These people ride with their arms spread, and very low on the shoulders of their horses: this method makes them stretch their necks, and gives a better appearance to their fore-hands; it conceals also a thick jaw, which, if the head was up, would prevent its yielding to the bit; it hides likewise the ewe-neck, which would otherwise show itself. Indeed, if you have a horse unsteady to the bit, formed with a natural heavy head, or one which carries his nose obstinately in the air, you must find his mouth where you can, and make the best of him.

Many horses are taught to start, by whipping them for starting. How is it possible they can know it is designed as a punishment? In the riding-house, you teach your horse to rise up before, and to spring and lash out his hinder legs, by whipping him when tied between two pillars, with his head a little at liberty. If he understood this to be a punishment for doing so, he would not by that method learn to do it. He seems to be in the same manner *taught* to spring and fly when he is frightened. Most horses would go quietly past an object they were beginning to fly from, if their riders, instead of gathering up their bridles, and showing themselves so ready, should throw the reins loose upon their necks.

When a horse starts at any thing on one side, most riders turn him out of the road, to make him go up to what he starts at: if he does not get the better of his fear, or readily comply, he generally goes past the object, making with his hinder parts, or croup, a great circle out of the road; whereas, he should learn to keep straight on, without minding objects on either side.

If he starts at any thing on the left, hold his head high, and keep it straight in the road, pulling it *from* looking at the thing he starts at, and keeping your right leg hard pressed against his side, towards his flank: he will then go straight along the road. By this method, and by turning his head a little more, he may be forced with his croup close up to what frightened him; for as his head is pulled one way, his croup necessarily turns the other. Always avoid a quarrel with your horse, if you can: if he is apt to start, you will find occasions enough to exercise his obedience, when what he starts at lies directly in his way, and you *must* make him pass; if he is not subject to start, you should not quarrel with him about a trifle.

It must be observed, however, that this rule in going past an object may perhaps be a little irregular in a managed horse, which will always obey the leg: but even such a horse, if he is really afraid, and not restive, it may not be amiss to make look another way; unless the object be something you would particularly accustom him to the sight of.

The case will also be different with a horse whose fear is owing to his being not used to objects; but such

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such a one is not to be rode by any horseman to whom these rules are directed: the starting here meant arises merely from the horse's being pampered, and springing through liveliness.

The notion of the necessity of making a horse go immediately up to every thing he is afraid of, and not suffering him to become master of his rider, seems to be in general carried too far. It is an approved and good method to conquer a horse's fear of the sound of a drum, by beating one near to him at the time of feeding him: this not only familiarizes the noise to him, but makes it pleasant, as a fore-runner of his meat *; whereas, if he was whipped up to it, he might perhaps start at it as long as he lived. Might not this be applied to his starting at other things, and show that it would be better to suffer him (provided he does not turn back) to go a little from and avoid an object he has a dislike to, and to accustom him to it by degrees, convincing him, as it were, that it will not hurt him; than to punish him, quarrel with him, and perhaps submit to his will at last, while you insist on his overcoming his fear in an instant? If he sees a like object again, it is probable he will recollect his dread, and arm himself to be disobedient.

* See Sect. v.

We are apt to suppose that a horse fears nothing so much as his rider; but may he not, in many circumstances, be afraid of instant destruction? of being crushed? of being drowned? of falling down a precipice? Is it a wonder that a horse should be afraid of a loaded waggon? may not the hanging load seem to threaten the falling on him? There cannot be a rule more general, than, in such a case, to shew him there is room for him to pass. This is done by turning his head a very little from the carriage, and pressing your leg, which is farthest from it, against his side.

A horse is not to stop without a sign from his rider. —Is it not then probable, that when driven up to a carriage he starts at it, he conceives himself obliged either to attack or run against it? Can he understand the rider's spurring him with his face directed to it, as a sign for him to pass it? That a horse is easily alarmed for his face and eyes (he will even catch back his head from a hand going to caress him); that he will not go with any force, face to face, even to another horse (if in his power to stop); and that he sees perfectly sideways,—may be useful hints for the treatment of horses with regard to starting.

Though you ought not to whip a horse for starting, there can be no good effect from clapping his neck with your hand to encourage him. If one took any notice of his starting, it should be rather with some tone of voice which he usually understood as an expression of dislike to what he is doing; for there is *opposition* mixed with his starting, and a horse will ever repeat what he finds has foiled his rider.

Notwithstanding the directions above given, of not pressing a horse up to a carriage he starts at; yet if one which you apprehend will frighten him meets you at a narrow part of the road, when you have once let him know he is to pass it, be sure you remain determined, and press him on. Do this more especially when part of the carriage has already passed you: for if, when he is frightened, he is accustomed to go back, and turn round, he will certainly do it if he finds, by your hand slackening, and legs not pressing, that you are irresolute; and this at the most dangerous point of time, when the wheels of the carriage take him as he turns. Remember not to touch the curb rein at this time; it will certainly check him. It is not known to every one, that the person who would lead a horse by the bridle, should not turn his face to him when he refuses to follow him: if, besides this, he raises his arms, shows his whip, or pulls the bridle with jerks, he frightens the horse, instead of persuading him to follow; which a little patience may bring about.

Ride with a snaffle; and use your curb, if you have one, only occasionally. Choose your snaffle full and thick in the mouth, especially at the ends to which the reins are fastened. Most of them are made too small and long; they cut the horse's mouth, and bend back over the bars of his jaw, working like pincers.

The management of the curb is too nice a matter to enter on here, farther than to prescribe great caution in the use of it: a turn of the wrist, rather than the weight of your arm, should be applied to it. The elasticity of a rod, when it hath hooked a fish, may give you some idea of the proper play of a horse's head on his bridle; his spirit and his pliableness are both marked by it.

A horse should never be put to do any thing in a curb which he is not ready at: you may force him, or pull his head any way with a snaffle; but a curb acts only in a straight line. It is true, that a horse will be turned out of one track into another by a curb, but it is because he knows it as a *signal*. When he is put to draw a chair, and does not understand the necessity he is then under of taking a larger sweep when he turns, you frequently see him *restive*, as it is then called: but put him on a snaffle, or buckle the rein to that part of the bit which does not curb him; and the horse submits to be pulled about, till he understands what is desired of him. These directions suppose your horse to have spirit, and a good mouth; if he has not, you must take him as he is, and ride him with such a bit as you find most easy to yourself.

When you ride a journey, be not so attentive to your horse's nice carriage of himself, as to your encouragement of him, and keeping him in good humour. Raise his head; but if he flags, you may indulge him with bearing a little more upon the bit than you would suffer in an airing. If a horse is lame, tender-footed, or tired, he naturally hangs upon his bridle. On a journey, therefore, his mouth will depend greatly on his strength and the goodness of his feet. Be then very careful about his feet, and let not a farrier spoil them. You will be enabled to keep them from danger, by the directions given under the article FARRIERY.

Very few, although practised in riding, know they have any power over a horse but by the bridle; or any use for the spur, except to make him go forward. A little experience will teach them a farther use. If the left spur touches him (and he is at the same time prevented from going forward), he has a sign, which he will soon understand, to move sidewise to the right. In the same manner to the left, if the right spur is closed to him: he afterwards, through fear of the spur,

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spur, obeys a touch of the leg; in the same manner as a horse moves his croup from one side of the stall to the other, when any one strikes him with his hand. In short, his croup is guided by the leg, as his head is by the bridle. He will never disobey the leg, unless he becomes restive. By this means you will have a far greater power over him; he will move sidewise, if you close one leg to him; and straight forward, if both: even when he stands still, your legs held near him will keep him on the watch; and with the slightest unseen motion of the bridle upwards, he will raise his head, and show his forehand to advantage.

On this use of the legs of the rider, and guidance of the croup of the horse, are founded all the *airs* (as the riding-masters express themselves) which are taught in the manege; the passage, or side-motion of troopers to close or open their files, and indeed all their evolutions. But the convenience of some degree of this discipline for common use is the reason of mentioning it here. It is useful if a horse is apt to stumble or start. If to the first, by pressing your legs to his flank, and keeping up his head, he is made to go light on his fore-legs, which is aiding and supporting him; and the same if he does actually stumble, by helping him at the very instant to exert himself, while as yet any part of him remains not irrecoverably impressed with the precipitate motion. Hence this use of the hand and legs of the rider is called *giving aids* to a horse; for, as to holding up the weight of a heavy unactive horse, by mere pulling, it is as impossible as to recover him when falling down a precipice.

A horse is supported and helped by the hands and legs of his rider in every action they require of him; hence he is said to perform his *airs* by the *aids* from his rider.

The same manner is useful if a horse starts. For if when he is beginning to fly to one side, you leg on the side he is flying to, he stops his spring immediately. He goes past what he started at, keeping straight on, or as you choose to direct him; and he will not fly back from any thing if you press him with both legs. You keep his haunches under him, going down a hill; help him on the side of a bank; more easily avoid the wheel of a carriage; and approach more gracefully and nearer to the side of a coach or horseman. When a pampered horse curvets irregularly, and twists his body to and fro, turn his head either to the right or left, or both alternately (but without letting him move out of the track), and press your leg to the opposite side: your horse cannot then spring on his hind-legs to one side, because your leg prevents him; nor to the other, because his head looks that way, and a horse does not start and spring to the side on which he looks. Here it may not be amiss to observe the impropriety of the habit which many riders have, of letting their legs shake against the sides of the horse: if a horse is taught, they are then continually pressing him to violent action; and if he is not, they render him insensible and incapable of being taught. The fretting of a hot horse will hence be excessive, as it can no otherwise be moderated than by the utmost stillness of the seat, hands, and legs of the rider.

Colts at first are taught to *bear* a bit, and by degrees to *pull* at it. If they did not press it, they could not be guided by it. By degrees they find their necks stronger than the arms of a man; and that they are capable of making great opposition, and often of foiling their riders. Then is the time to make them supple and pliant in every part. The part which of all others requires most this pliancy is the neck. Hence the metaphor of *stiff-necked* for *disobedient*. A horse cannot move his head but with the muscles of his neck; this may be called his *helm*; it guides his course, changes and directs his motion.

The use of this pliancy in the different parts and limbs of a horse has been already shown in a former section. The present section being directed to the *inexperienced* horseman, it may suffice to add, that *his* idea of suppleness need only be, that of an ability and readiness in a horse to move every limb, on a sign given him by the hands or legs of his rider; as also, to bend his body, and move in a short compass, quick and collected within himself, so as instantly to be able to perform any other motion.

Horsham.

HORSHAM, a town of Sussex, seated near St Leonard's forest, 38 miles from London. It has its name from Horsa, brother to Hengist the Saxon: and is one of the largest towns in the county. It has sent members to parliament ever since the 30th of Edward I. and is the place where the county-goal is held, and often the assizes. It is a borough by prescription, with the title of two bailiffs and burgage-holders within and without the borough, &c. who elect the members of parliament, and they are returned by the bailiffs chosen yearly by a court-leet of the lord of the manor, who return four candidates to the steward, and he nominates two of them for the office. Here is a very fine church, and a well endowed free-school. Great store of poultry is bought up for London at its market on Saturday, and it has a patent also for a monthly market.

Hortagilers, Hortensius.

HORTAGILERS, in the grand signior's court, upholsterers, or tapestry-hangers. The grand signior has constantly 400 in his retinue when he is in the camp: these go always a day's journey before him, to fix upon a proper place for his tent, which they prepare first; and afterwards those of the officers, according to their rank.

HORTENSIUS, QUINTUS, a celebrated Roman orator, the cotemporary of Cicero, pleaded with universal applause at 19 years of age, and continued the same profession during 48 years. But being at last eclipsed by Cicero, he quitted the bar, and embraced a military life: became a military tribune, prætor, and

and afterwards consul about 80 B. C. Cicero speaks of him in such a manner as makes us regret the loss of his orations. Hortensius had a wonderful memory, and delivered his orations without writing down a single word, or forgetting one particular that had been advanced by his adversaries. He died very rich, a little before the civil war, which he had endeavoured by all possible means to prevent.

HORTUS SICCUS, a DRY GARDEN; an appellation given to a collection of specimens of plants, carefully dried and preserved.

The value of such a collection is very evident, since a thousand minutiæ may be preserved in well dried specimens of plants, which the most accurate engraver would overlook. We shall therefore give two methods of drying and preserving a *hortus siccus;* the first by Sir Robert Southwell in the Philosophical Transactions, N° 237; and the other by Dr Hill, in his review of the works of the Royal Society, with his objections to Sir Robert's method.

According to the former gentleman, the plants are to be laid flat between papers, and then put between two smooth plates of iron, screwed together at the corners; and in this condition committed to a baker's oven for two hours. When taken out, they are to be rubbed over with a mixture of equal parts of aquafortis and brandy; and after this to be fastened down on paper with a solution of the quantity of a walnut of gum tragacanth dissolved in a pint of water. See HERBAL.

To this the Doctor objects, that the heat of an oven is much too uncertain to be employed in so nice an operation; and that the space of time ordered for continuing the plants in it is of no information, unless the degree of heat, and even the different nature of the plant as to its succulency and the firmness or tenderness of its fibres, be attended to; there being scarcely any two plants alike in these particulars: consequently the degree and duration of heat sufficient for one plant would destroy another. Beside which, the acid used destroys the colour of many plants; and never recovers that of others lost in the drying; and frequently after the plant is fixed down, rots both the paper it is fixed to, and that which falls over it. Dr Hill's method is as follows. Take a specimen of a plant in flower, and with it one of its bottom leaves if it have any; bruise the stalk if too rigid, or slit it if too thick: spread out the leaves and flowers on paper, cover it with more paper, and lay a weight over all. At the end of 18 hours take out the plants, now perfectly flattened, and lay them on a bed of dry common sand; sift more dry sand over them to the depth of two inches, and thus let them lie about three weeks: the less succulent dry much sooner, but they take no harm afterward. If the floor of a garret be covered in spring with sand two inches deep, leaving space for walking to the several parts, it will receive the collection of a whole summer; the covering of sand being sifted over every parcel as laid in, they need no farther care from the time of laying them till they are taken up to be stuck on paper. The cement used by the Doctor is thus prepared: early in the spring, put two ounces of camphor into three quarts of water in a large bottle, shake it from time to time, and when the first collected plants are ready for the fastening down, put into a pint of the water, poured off into an earthen vessel that will bear the fire, two ounces of common glue, such as is used by the carpenters, and the same quantity of ichthyocolla beat to shreds; let them stand 36 hours, then gently boil the whole a few moments, and strain it off through a coarse cloth: this is to be warmed over a gentle heat when it is to be used, and the back of the plants smeared over with a painter's brush: after this lay them on paper, and gently press them for a few minutes, then expose them to the air a little; and finally, lay them under a small weight between quires of paper to be equally dried.

It is scarce to be conceived how strongly the water becomes impregnated with the camphor by this simple process: a part of it indeed flies off in the making of the cement and the using of it: but enough remains with the plants to prevent the breeding of insects in it. He farther observes, that plants may be dried very well without sand, by only putting them frequently into fresh quires of paper, or a few, by only pressing them between the leaves of a book: but the sand method preserves the colour best, and is done with least trouble.

Another method much better than that of the oven is the flattening and drying the plant by passing a common smoothing iron for linen over the papers between which it is laid; but for nice things the most perfect of all methods is that by a common sand heat, such as is used for chemical purposes. The cold sand is to be spread smooth upon this occasion, the plant laid on it carefully flatted, and a thick bed of sand sifted over: the fire is then to be made, and the whole process carefully watched until by a very gentle heat the plant be carefully dried. The colour of the tenderest herb may by this manner be preserved; and flowers, that can no way else be preserved, may be managed perfectly well thus.

HORUS, a renowned deity of ancient Egypt. He was an emblem of the sun. Plutarch (in his treatise *de Iside et Osiride*) says, "that virtue which presides over the sun, whilst he is moving through space, the Egyptians called *Horus* and the Greeks *Apollo*." Job also calls *Ur* or *Orus* the sun—"If I gazed upon the sun (*Ur, Orus*) when he was shining, or on (*Järêcha*) the moon walking in brightness, and my heart hath been severely enticed (i. e. to worship), or my mouth hath kissed my hand; this also were an iniquity to be punished by the judge, for I should have denied the God who is above." Chap. xxxi. ver. 26, 27, 28.

The interpretation left by Hermapion of the hieroglyphics engraved on the obelisk of Heliopolis (according to Ammianus Marcellinus), offers these remarkable words: "Horus is the supreme lord and author of time." These qualities, it is known, were chiefly attributed to Osiris: that they may apply, therefore, to Horus, he must necessarily denote the star of the day in certain circumstances; and this is what is explained to us by the oracle of Apollo of Claros:

Learn that the first of the gods is Jao.
He is called *invisible* in winter, Jupiter in the spring,
The *sun* in summer, and towards the end of autumn
the tender *Jao*.

The star of the day, on attaining the summer solstice, and called *per excellentiam* the Sun, is the same as Horus.

Horus. rus. In fact, the Egyptians reprefented him borne on lions, which fignified his entrance into the fign of the lion. They who prefided over the divine inftitutions, then placed fphynxes at the head of the canals and facred fountains, to warn the people of the approaching inundation. Macrobius *, who informs us why the Greeks gave Horus the name of Apollo, confirms this fentiment: "In the myfteries (fays he) they difcover as a fecret, which ought to be inviolable, that the fun arrived in the upper hemifphere, is called Apollo." Thefe teftimonies concur in proving, that this emblematical deity was no other than the ftar of day, paffing through the figns of fummer.

* Saturnal. lib. 1.

Thefe lights may lead us to the explication of the facred fable, which the priefts publifhed on the fubject of Horus; for they enveloped in myftery every point of their religion. Plutarch gives it at length in his treatife of Ifis and Ofiris: The following are the principal traits. They faid that he was the fon of Ofiris and of Ifis; that Typhon, after killing his brother Ofiris, took poffeffion of the kingdom; that Horus, leaguing himfelf with Ifis, avenged the death of his father, expelled the tyrant from his throne without depriving him of life, and reigned glorioufly in Egypt. A perfon who has travelled ever fo little in Egypt, eafily difcovers natural phenomena hid under the veil of fable. In the fpring, the wind khamfin frequently makes great ravages there. It raifes whirlwinds of burning fand, which fuffocate travellers, darken the air, and cover the face of the fun in fuch a manner as to leave the earth in perfect obfcurity. Here is the death of Ofiris and the reign of Typhon. Thefe hurricanes break out ufually in the months of February, March, and April. When the fun approaches the fign of the lion, he changes the ftate of the atmofphere, difperfes thefe tempefts, and reftores the northerly winds, which drive before them the malignant vapours, and preferve in Egypt coolnefs and falubrity under a burning fky. This is the triumph of Horus over Typhon, and his glorious reign. As the natural philofophers acknowledge the influence of the moon over the ftate of the atmofphere, they united her with this god, to drive the ufurper from the throne. The priefts confidering Ofiris as the father of time, might beftow the name of his fon on Horus, who reigned three months in the year. This, according to Mr Savary †, is the natural explication of this allegory. And all enlightened men, he thinks, muft have underftood this language, which was familiar to them. The people only, whofe feeble fight extends no farther than the exterior, without diving into the true meaning of things, might regard thefe allegorical perfonages as real gods, and decree prayers and offerings to them.

† Letters on Egypt, ii. 403.

Jablonfki, who has interpreted the epithet of Aruceri, which the Egyptians gave to Horus, pretends that it fignifies *efficacious virtue*. Thefe expreffions perfectly characterife the phenomena which happened during the reign of this god. It is in fummer, in fact, that the fun manifefts all its power in Egypt. It is then that he fwells the waters of the river with rains, exhaled by him in the air, and driven againft the fummits of the Abyffinian mountains; it is then that the hufbandman reckons on the treafures of agriculture. It was natural for them to honour him with the name of *Arueri*, or *efficacious virtue*, to mark thefe aufpicious effects.

Hofanna ‖ Hofpinian.

HOSANNA, in the Hebrew ceremonies, a prayer which they rehearfed on the feveral days of the feaft of tabernacles. It was thus called, becaufe there was frequent repetition therein of the word הושענא, *ferva nunc*, or *ferva precor*; i. e. fave us now; or fave us, we pray.

There are divers of thefe hofannahs. The Jews call them *hofchannoth*; i. e. the *hofannahs*. Some are rehearfed on the firft day, others on the fecond, &c. which they called *hofanna* of the firft day, *hofanna* of the fecond day, &c.

Hosanna Rabba, or *Grand Hofanna*, is a name they give to their feaft of tabernacles, which lafts eight days; becaufe during the courfe thereof, they are frequently calling for the affiftance of God, the forgivenefs of their fins, and his bleffing on the new year; and to that purpofe they make great ufe of the hofchannoth, or prayers above-mentioned.—The Jews alfo applied the term *hofanna rabba*, in a more peculiar manner, to the feventh day of the feaft of tabernacles; becaufe they apply themfelves more immediately on that day to invoke the divine bleffing, &c.

HOSE, from the Saxon *Hofa*, a ftocking. See Stocking.

HOSEA, the firft in number of the minor Hebrew prophets, as arranged in the Hebrew and Greek bibles, although probably the third in a chronological fenfe. He was the fon of Beeri, but it is uncertain to what tribe he belonged. He prophefied in the reigns of Uzziah, Jotham, Ahaz, and Hezekiah, kings of Judah, and in the time of Jeroboam, who was king of Ifrael. If he uttered predictions during 66 years, between 790 and 724 before Chrift, then he difcharged the office of a facred feer eight years during the reign of Jeroboam II. 33 in the reign of Uzziah, the entire reigns of Jotham and Ahaz, and three years in the reign of Hezekiah; but could not have furvived the taking of Samaria. He reproved the vices of kings as well as their fubjects, mixing threatenings of divine vengeance with promifes of pardon in confequence of repentance. His ftyle is concife, fententious and abrupt. His fhort and lively comparifons are numerous. He is fometimes diftinguifhed by great force of expreffion, has many beautiful paffages, and in fome parts is truly fublime. Dr Newcome was of opinion that the chief difficulty in underftanding this prophet is owing to the corrupt readings which disfigure the printed text, and thefe he freely corrected from the collations of Dr Kennicott. On the other hand, Dr Horfley protefts earneftly againft Dr Newcome's opinion, declaring that the corruptions can be no caufe of obfcurity; but we muft leave it to our readers to determine which of thefe two great men is in the right, from an attentive perufal of their own works, affured that they will decide in favour of him who furnifhes the beft helps for underftanding this prophet.

HOSPINIAN, Rodolphus, one of the greateft writers that Switzerland has given birth to. He was born in 1547, at Altorf near Zurich; obtained the freedom of Zurich; and was made provifor of the abbey fchool. Notwithftanding this employment, he undertook a noble work of vaft extent, which was a *Hiftory of the Errors of Popery*. Though he could not complete this work according to his plan, he publifhed fome confiderable parts of it: what he publifhed on the Eucharift, and another work called *Concordia Difcors*, exceedingly exafperated the Lutherans. He did not reply to them; but turning his arms againft the Jefuits, publifhed *Hiftoria Jefuitica*, &c. Thefe writings gained him preferment; he being appointed archdeacon of Caroline church, and then minifter of the abbey-church. He died in 1626; and there was an edition of his works publifhed at Geneva 1681, in feven volumes in folio.

HOSPITAL, popularly SPITTAL, a place or building erected, out of charity, for the reception and fupport of the poor, aged, infirm, fick, and otherwife helplefs. The word is formed of the Latin *hofpes*, "hoft, ftranger." See HOST.

In the ages of the church, the bifhop had the immediate charge of all the poor, both found and difeafed, as alfo of widows, orphans, ftrangers, &c.—When the churches came to have fixed revenues allotted them, it was decreed, that at leaft one fourth part thereof fhould go to the relief of the poor; and to provide for them the more commodioufly, divers houfes of charity were built, which are fince denominated *hofpitals*. They were governed wholly by the priefts and deacons, under the infpection of the bifhop. In courfe of time, feparate revenues were affigned for the hofpitals; and particular perfons, out of motives of piety and charity, gave lands and money for erecting of hofpitals. When the church difcipline began to relax, the priefts, who till then had been the adminiftrators of hofpitals, converted them into a fort of benefices, which they held at pleafure, without giving account thereof to any body; referving the greateft part of the income to their own ufe; fo that the intentions of the founders were fruftrated.—To remove this abufe, the council of Vienne exprefsly prohibited the giving any hofpital to fecular priefts in the way of a benefice; and directed the adminiftration thereof to be given to fufficient and refponfible laymen, who fhould take an oath, like that of tutors, for the faithful difcharge thereof, and be accountable to the ordinaries.—This decree was executed and confirmed by the council of Trent.

In Britain, hofpitals are buildings properly endowed, or otherwife fupported by charitable contributions, for the reception and fupport of the poor, aged, infirm, fick, or helplefs.

A charitable foundation laid thus for the fuftenance and relief of the poor is to continue for ever. Any perfon feized of an eftate in fee, may, by deed inrolled in chancery, erect and found an hofpital, and nominate fuch heads and governors therein as he fhall think fit; and this charitable foundation fhall be incorporated, and fubject to the infpection and guidance of the heads and vifitors nominated by the founder. Likewife fuch corporations fhall have, take, and purchafe lands, fo as not to exceed 200l. a year, provided the fame be not held of the king; and to make leafes, referving the accuftomed yearly rent. See CORPORATION.

HOSPITAL, MICHAEL DE L', chancellor of France in the 16th century, was one of the greateft men of his age, and had raifed himfelf by degrees. He agreed to an edict much feverer againft the Proteftants than he could have wifhed, to prevent the introduction of the inquifition. It was that of Romorantin. The fpeeches he made, in order to infpire a fpirit of toleration, made him much fufpected by the Roman Catholics, and extremely odious to the court of Rome. The maxims of ftate upon which he regulated himfelf were of great advantage to France, fince he formed fome difciples who oppofed, in proper time, the pernicious attempts of the leaguers, and rendered them abortive. His pacific views being difliked by Catharine de Medicis, who had contributed to his advancement, fhe excluded him from the council of war, and occafioned his difgrace. He retired, however, of his own accord, in 1568; and fpent the reft of his life at his country-feat at Vignai, where he died in 1573, aged 68. His poems are efteemed. He alfo publifhed fome excellent fpeeches and memoirs.

HOSPITAL, *William-Francis-Antony, Marquis of*, a great mathematician of France, was born of an ancient family in 1661. He was a geometrician almoft from his infancy; for one day being at the duke of Rohan's, where fome able mathematicians were fpeaking of a problem of Pafchal's which appeared to them extremely difficult, he ventured to fay, that he believed he could folve it. They were amazed at fuch prefumption in a boy of 15, for he was then no more; neverthelefs, in a few days he fent them the folution. He entered early into the army, and was a captain of horfe; but being extremely fhort-fighted, and expofed on that account to perpetual inconveniences and errors, he at length quitted the army, and applied himfelf entirely to his favourite amufement. He contracted a friendfhip for Malebranche, and took his opinion upon all occafions. In 1693, he was received an honorary member of the academy of fciences at Paris; and he publifhed a work upon Sir Ifaac Newton's calculations, entitled, *L'Analyfe des infinimens petits*. He was the firft in France who wrote upon this fubject; and on this account was regarded almoft as a prodigy. He engaged afterwards in another work of the mathematical kind, in which he included *Les Sectiones Coniques, les Lieux Geometriques, la Conftruction des Equations, et Une Theorie des Courbes Mechaniques*: but a little before he had finifhed it, he was feized with a fever, of which he died Feb. 2. 1704, aged 43. It was publifhed after his death.

HOSPITALITY, the practice of entertaining ftrangers. Dr Robertfon, fpeaking of the middle ages, fays, "Among people whofe manners are fimple, and who are feldom vifited by ftrangers, hofpitality is a virtue of the firft rank. This duty of hofpitality was fo neceffary in that ftate of fociety which took place during the middle ages, that it was not confidered as one of thofe virtues which men may practife or not, according to the temper of their minds and the generofity of their hearts. Hofpitality was enforced by ftatutes, and thofe who neglected the duty were liable to punifhment. The laws of the Salvi ordained that the moveables of an inhofpitable perfon fhould be confifcated, and his houfe burnt. They were even fo folicitous for the entertainment of ftrangers, that they permitted the landlord to fteal for the fupport of his gueft."

The hofpitality of our Britifh anceftors, particularly of the great and opulent barons, hath been much admired,

mired, and conſidered as a certain proof of the nobleneſs and generoſity of their ſpirits. The fact is well atteſted. The caſtles of the powerful barons were capacious palaces, daily crowded with their numerous retainers, who were always welcome to their plentiful tables. They had their privy counſellors, their treaſurers, marſhals, conſtables, ſtewards, ſecretaries, chaplains, heralds, purſuivants, pages, henſhmen or guards, trumpeters, minſtrels, and in a word all the officers of a royal court. The etiquette of their families was an exact copy of that of the royal houſehold; and ſome of them lived in a degree of pomp and ſplendour little inferior to that of the greateſt kings. Richard Neville, earl of Warwick, we are told, "was ever had in great favour of the commons of the land, becauſe of the exceeding houſehold which he daily kept in all countries wherever he ſojourned or lay: and when he came to London, he held ſuch an houſe, that ſix oxen were eaten at a breakfaſt; and every tavern was full of his meat." The earls of Douglas in Scotland, before the fall of that great family, rivalled or rather exceeded their ſovereigns in pomp and profuſe hoſpitality. But to this manner of living it is highly probable theſe great chieftains were prompted by a deſire of increaſing the number and attachment of their retainers, on which, in thoſe turbulent times, their dignity, and even their ſafety, depended, as much as to the innate generoſity of their tempers. Thoſe retainers did not conſtantly reſide in the families of their lords; but they wore their liveries and badges, frequently feaſted in their halls, ſwelled their retinues on all great ſolemnities, attended them in their journeys, and followed them into the field of battle. Some powerful chieftains had ſo great a number of theſe retainers conſtantly at their command, that they ſet the laws at defiance, were formidable to their ſovereigns, and terrible to their fellow-ſubjects; and ſeveral laws were made againſt giving and receiving liveries. But theſe laws produced little effect in this period.

Hoſpitality was not confined to the great and opulent, but was practiſed rather more than it is at preſent by perſons in the middle and lower ranks of life. But this was owing to neceſſity, ariſing from the ſcarcity of inns, which obliged travellers and ſtrangers to apply to private perſons for lodging and entertainment; and thoſe who received them hoſpitably acquired a right to a ſimilar reception. This was evidently the caſe in Scotland in the firſt part of this period. James I. A. D. 1424, procured the following act of parliament. "It is ordanit, That in all burrow townis, and throuchfairis quhair commoun paſſages ar, that thair be ordanit hoſtillaries and reſettis, havand ſtables and chalmers; and that men find with thame bread and aill, and all uther fude, alſweil for horſe as men, for reſonable price." But travellers had been ſo long accuſtomed to lodge in private houſes, that theſe public inns were quite neglected; and thoſe who kept them preſented a petition to parliament, complaining, "That the liegis travelland in the realme, quhen they cum to burrowis and throuchfairis, herbreis thame not in hoſtillaries, bot with thair acquaintance and freindis." This produced an act prohibiting travellers to lodge in private houſes where there were hoſtlaries, under the penalty of 40s. and ſubjecting thoſe who lodged them to the ſame penalty.

The inhabitants of the Highlands and the Weſtern Iſles were remarkable for their hoſpitality and kindneſs to ſtrangers, and ſtill retain the ſame diſpoſition. See HIGHLANDERS.

HOSPITALLERS, HOSPITALARII, an order of religious knights, who built an hoſpital at Jeruſalem, wherein pilgrims were received. To theſe Pope Clement V. transferred the effects and revenues of the Templars; whom, by a council held at Vienne, he ſuppreſſed for their many and great miſdemeanours. Theſe hoſpitallers were otherwiſe called *Knights of St John of Jeruſalem;* and are the ſame with thoſe whom we now call *Knights of Malta.*

HOSPITIUM, a term uſed in old writers either for an inn or a monaſtery, built for the reception of ſtrangers and travellers. See INN and MONASTERY.

HOSPODAR, a title borne by the princes of Walachia and Moldavia, who receive the inveſtiture of their principalities from the grand ſignior. He gives them a veſt and ſtandard; they are under his protection, and obliged to ſerve him, and he even ſometimes depoſes them; but in other reſpects they are abſolute ſovereigns within their own dominions.

HOST, HOSPES, a term of mutual relation, applied both to a perſon who lodges and entertains another, and to the perſon thus lodged, &c.—The word is formed of the Latin *hoſpes*, which ſome will have thus called *quaſi hoſtium* or *oſtium petens;* for *oſtium* was anciently written with an aſpirate.—Thus the innkeeper ſays, he has a good *hoſt*, in ſpeaking of the traveller who lodges with him: and the traveller, again, ſays, he has a kind *hoſt*, in ſpeaking of his landlord.

It muſt be obſerved then, that it was the cuſtom among the ancients, when any ſtranger aſked for lodging, for the maſter of the houſe, and the ſtranger, each of them to ſet a foot on their own ſide of the threſhold, and ſwear they would neither of them do any harm to the other. It was this ceremony that raiſed ſo much horror againſt thoſe who violated the law or right of hoſpitality on either ſide; inaſmuch as they were looked on as perjured.

Inſtead of *hoſpes*, the ancient Latins called it *hoſtis;* as Cicero himſelf informs us: though, in courſe of time, *hoſtis* came to ſignify an enemy; ſo much was the notion of hoſpitality altered.

HOST is alſo uſed by way of abbreviation for *hoſtia*, a victim or ſacrifice offered to the Deity. In this ſenſe, *hoſt* is more immediately underſtood of the perſon of the Word incarnate, who was offered up an hoſt or *hoſtitia* to the Father on the croſs for the ſins of mankind. See HOSTIA.

HOST, in the church of Rome, a name given to the elements uſed in the euchariſt, or rather to the conſecrated wafer; which they pretend to offer up every day a new hoſt or ſacrifice for the ſins of mankind.—They pay adoration to the hoſt, upon a falſe preſumption that the elements are no longer bread and wine, but tranſubſtantiated into the real body and blood of Chriſt. See TRANSUBSTANTIATION.—Pope Gregory IX. firſt decreed a bell to be rung, as the ſignal for the people to betake themſelves to the adoration of the hoſt.—The veſſel wherein the hoſts are kept is called the *cibory;* being a large kind of covered chalice.

HOSTAGE, a perſon given up to an enemy as a ſecurity for the performance of the articles of a treaty.

HOSTIA, Host, in antiquity, a victim offered in ſacrifice to a deity.

The word is formed from *hoſtis*, "enemy;" it being the cuſtom to offer up a ſacrifice before they joined battle, to render the gods propitious; or, after the battle was over, to give them thanks. Some chooſe to derive the word from *hoſtio*, q. d. *ferio*, "I ſtrike." Iſidore on this word remarks, that the name *hoſtia* was given to thoſe ſacrifices which they offered before they marched to attack an enemy, (*antequam ad hoſtem pergerent*); in contradiſtinction from *victima*, which were properly thoſe offered after the victory.

Hoſtia alſo ſignified the leſſer ſorts of ſacrifice, and *victima* the larger. A. Gellius ſays, that every prieſt, indifferently, might ſacrifice the *hoſtia*, but that the *victima* could be offered by none but the conqueror himſelf. But, after all, we find theſe two words promiſcuouſly uſed one for the other by ancient writers. We read of many kinds of *hoſtiæ*: as *hoſtiæ puræ*, which were pigs or lambs ten days old; *hoſtiæ præcidaneæ*, ſacrifices offered the day before a ſolemn feaſt; *hoſtiæ bidentes*, ſacrifices of ſheep or other animals of two years old; *hoſtiæ eximiæ*, a ſacrifice of the flower of the flock; *hoſtiæ ſuccedaneæ*, ſacrifices offered after others which had exhibited ſome ill omen; *hoſtiæ ambarvales*, victims ſacrificed after having been ſolemnly led round the fields at the *ambarvalia*; *hoſtiæ amburbiales*, victims ſlain after the *amburbium*; *hoſtiæ caneares* or *caviares*, victims ſacrificed every fifth year by the college of pontiffs, in which they offered the part of the tail called *caviar*; *hoſtiæ prodigiæ*, ſacrifices in which the fire conſumed all, and left nothing for the prieſts; *hoſtiæ piaculares*, expiatory ſacrifices; *hoſtiæ ambegnæ* or *ambiegnæ*, ſacrifices of cows or ſheep that had brought forth twins; *hoſtiæ harugæ*, victims offered to predict future events from; *hoſtiæ mediales*, black victims offered at noon.

HOSTILITY, the action of an enemy, or a ſtate of warfare. The word is Latin, *hoſtilitas*, formed of the primitive *hoſtis*, which ſignifies "enemy;" and which anciently ſignified "ſtranger," *hoſpes*.

HOT-BEDS, in *Gardening*, beds made with freſh horſe-dung, or tanners bark, and covered with glaſſes to defend them from cold winds.

By the ſkilful management of hot-beds, we may imitate the temperature of warmer climates; by which means, the ſeeds of plants brought from any of the countries within the torrid zone may be made to flouriſh even under the poles.

The hot-beds commonly uſed in kitchen-gardens are made with new horſe-dung mixed with the litter of a ſtable, and a few ſea-coal-aſhes, which laſt are of ſervice in continuing the heat of the dung. This ſhould remain ſix or ſeven days in a heap; and being then turned over, and the parts mixed well together, it ſhould be again caſt into a heap; where it may continue five or ſix days longer, by which time it will have acquired a due heat. Theſe hot-beds are made in the following manner: In ſome ſheltered part of the garden, dig out a trench of a length and width proportionable to the frames you intend it for; and if the ground be dry, about a foot or a foot and a half deep; but if it be wet, not above ſix inches: then wheel the dung into the opening, obſerving to ſtir every part of it with a fork, and to lay it exactly even and ſmooth on every part of the bed, laying the bottom part of the heap, which is commonly free from litter, upon the ſurface of the bed: and if it be deſigned for a bed to plant out cucumbers to remain for good, you muſt make a hole in the middle of the place deſigned for each light about ten inches over, and ſix deep, which ſhould be filled with good freſh earth, thruſting in a ſtick to ſhow the places where the holes are; then cover the bed all over with the earth that was taken out of the trench about four inches thick, and put on the frame, letting it remain till the earth be warm, which commonly happens in three or four days after the bed is made, and then the plants may be placed in it. But if your hot-bed be deſigned for other plants, there need be no holes made in the dung; but after having ſmoothed the ſurface with a ſpade, you ſhould cover the dung about three or four inches thick with good earth, putting on the frames and glaſſes as before. In making theſe beds, care muſt be taken to ſettle the dung cloſe with a fork; and if it be pretty full of long litter, it ſhould be trod down equally on every part. During the firſt week or ten days after the bed is made, you ſhould cover the glaſſes but ſlightly in the night, and in the day-time carefully raiſe them, to let out the ſteam: but as the heat abates, the covering ſhould be increaſed; and as the bed grows cold, new hot dung ſhould be added round the ſides of it.

The hot-bed made with tanners bark is, however, much preferable to that deſcribed above, eſpecially for all tender exotic plants and fruits, which require an even degree of warmth to be continued for ſeveral months, which cannot be effected with horſe-dung. The manner of making them is as follows: Dig a trench about three feet deep, if the ground be dry; but if wet, it muſt not be above a foot deep at moſt, and muſt be raiſed two feet above the ground. The length muſt be proportioned to the frames intended to cover it; but it ſhould never be leſs than ten or twelve feet, and the width not leſs than ſix. The trench ſhould be bricked up round the ſides to the above-mentioned height of three feet, and filled in the ſpring with freſh tanners bark that has been lately drawn out of their vats, and has lain in a round heap, for the moiſture to drain out of it, only three or four days: as it is put in, gently beat it down equally with a dung-fork; but it muſt not be trodden, which would prevent its heating, by ſettling it too cloſe: then put on the frame, covering it with glaſſes; and in about ten days or a fortnight it will begin to heat; at which time plunge your pots of plants or ſeed into it, obſerving not to tread down the bark in doing it. Theſe beds will continue three or four months in a good temper of heat; and if you ſtir up the bark pretty deep, and mix a load or two of freſh bark with the old when you find the warmth decline, you will preſerve its heat two or three months longer. Many lay ſome hot horſe-dung in the bottom of the trench under the bark; but this ought never to be practiſed unleſs the bed is wanted ſooner than the bark would heat of itſelf, and even then there ought only to be a ſmall quantity of dung at the bottom.

The

The frames which cover these beds should be proportioned to the several plants they are designed to contain. If they are to cover the ananas or pine-apple, the back part should be three feet high, and the lower part 15 inches: if the bed be intended for taller plants, the frame must be made of a depth proportionable to them: but if it be for sowing of seeds, the frame need not be above 14 inches high at the back, and 7 in the front; by which means the heat will be much greater.

Hot-House. See STOVE and HYPOCAUSTUM.

HOTEL, a French term, anciently signifying a house or dwelling place.—It is now more commonly used for the palaces or houses of the king, princes, and great lords. In this sense they say, the *hotel de Conde*, *hotel de Conti*, *hotel du Louvre*, &c.

The grand *prevot de l'hotel*, is the first judge of the officers of the king's household. His jurisdiction is much like that of lord steward of the household of the king of England.

The *hotel de ville* is what we call a *town-house* or *town-hall*.

HOTEL, is likewise used for a large inn, also for a large lodging-house ready furnished.

HOTTENTOTS, a people in the southern part of Africa, whose country extends north by west from the Cape of Good Hope beyond the mouth of Orange river, and from that cape in an east-north-east direction to the mouth of the great Fish river, which parts it from Caffraria. According to Sanutus, this coast, beginning at the Mountains of the Moon under the tropic of Capricorn in $23\frac{1}{2}°$ S. Lat. extends north beyond the Cape to the coast of Zanguebar; having the Indian sea on the east, the Ethiopic on the west, the southern ocean on the south; and on the north the kingdoms of Mattatan, Monomotapa, and the coast of Zanguebar, or rather the Mountains of the Moon, which divide it from the rest of the continent.

The Europeans first became acquainted with this country in the year 1493, when Bartholomew Diaz, a Portuguese admiral, discovered the most southerly point of Africa now called the *Cape of Good Hope*, but by him *Cabo dos totos tormentos*, or Cape of all Plagues, on account of the storms he met with in the neighbourhood; but John, then king of Portugal, having from the account of Diaz concluded that a passage to the East Indies was now discovered, changed the name to that of the *Cape of Good Hope*, which it still retains. In 1497, it was circumnavigated by Vasco de Gama, who made a voyage to India that way; however, it remained useless to Europeans till the year 1650, when Van Riebeck a Dutch surgeon first saw the advantages that would accrue to the East India company in Holland from a settlement at such a convenient distance both from home and from India. The colony which he planted has ever since continued in the hands of the Dutch, has greatly increased in value, and is visited by all the European ships trading to the East Indies. See GOOD-HOPE.

The country now possessed by the Dutch is of pretty considerable extent, and comprehends that part of the African coast on the west called *Terra de Natal*. It is naturally barren and mountainous; but the industry of the Dutch hath overcome all natural difficulties, and it now produces not only a sufficiency of all the necessaries of life for the inhabitants, but also for the refreshment of all the Europeans who pass and repass that way.

The coast abounds in capes, bays, and roads. Thirty leagues to the east of the Cape of Good Hope, in S. Lat. 34. 21. is another cape which runs out beyond 35°, called by the Portuguese, who first doubled it, *Cabo dos Agulhas*, or the *Cape of Needles*, on account of some strange variations in the magnetical needle observed as they came near it. Near this cape is a flat shore, with plenty of fish: it begins in the west near a fresh-water river, and, extending 15 leagues in the main sea, ends in the east near *Fish-bay*. Cabo Falso, so called by the Portuguese, who returning from India mistook it for the Cape of Good Hope, lies to the eastward between these two capes, about eight or nine leagues beyond that of Good Hope. Along the coasts, on both sides of the Cape of Good Hope, are many fine bays. Twenty-seven leagues to the north-west is Saldanha bay, so named from a Portuguese captain shipwrecked on the coast. The largest and most commodious is *Table Bay*, on the south, and near the mountain of that name, six leagues in circumference, with four fathoms water close to the beach. Opposite to this bay is *Robu Eilan*, or the island of Rabbits, in 34. 30. S. Lat. 67 leagues east from the Cape of Good Hope. Peter Both, in 1661, discovered a bay, which he named *Uleest*, sheltered only from north winds, in which is a small island, and on the west a rivulet of fresh water extremely convenient for European mariners. Twenty-five or thirty leagues farther east, Both discovered Marshal Bay, afterwards named by the Portuguese *Seno Formoso*. Next to this is *Seno de Lago*, from its resemblance to a lake. There are several roads in this bay, and an island called *Ilha dos Caos*. Cabo de S. Francisco, and Cabo das Serras are marked upon charts between these two bays. Near the latter of these capes is Cabo de Arecito, and the island Contento; and something more north-east is St Christopher's river, called *San Christovano* by the Portuguese, and by the Hottentots *Nagod*. The country beyond this river was called by the Portuguese, who discovered it on the day of our Lord's nativity, *Terra de Natal*. Between the Cape of Good Hope and Cabo das Agulhas are the Sweet, Salt, and Jagulina rivers, which run into the sea, and Sweet-water river flows from the Table-mountain.

The most remarkable mountains in this country are, Table-mountain, Devil's Tower, Lion's Head, and the Tiger-hills. The three first lie near Table-bay, and surround Table-valley, where the Cape-town stands. (See the article *Good-Hope*.) Mr Forster, in his voyage, informs us, that "the extremity of Africa towards the south is a mass of high mountains, of which the outermost are craggy, black, and barren, consisting of a coarse granite, which contains no heterogeneous parts, such as petrified shells, &c. nor any volcanic productions. The ground gradually rises on all sides towards the three mountains which lie round the bottom of the bay, keeping low and level only near the sea-side, and growing somewhat marshy in the isthmus between False and Table bays, where a salt rivulet falls into the latter. The marshy part has some verdure, but inter-

mixed

Hottentots. mixed with a great deal of ſand. The higher grounds, which, from the ſea-ſide, have a parched and dreary appearance, are, however, covered with an immenſe variety of plants, among which are a prodigious number of ſhrubs, but ſcarce one or two ſpecies that deſerve the name of *trees*. There are alſo a few ſmall plantations wherever a little run of water moiſtens the ground. The aſcent of Table-mount is very ſteep and difficult, on account of the number of looſe ſtones which roll away under the feet of the traveller. About the middle of the mountain is a bold, grand chaſm, whoſe walls are perpendicular, and often impending rocks piled up in ſtrata. Some rills of water ooze out of crevices, or fall from precipices in drops, giving life to hundreds of plants and low ſhrubs, in the chaſm. The ſummit of the mountain is nearly level, very barren, and bare of ſoil; ſeveral cavities, however, are filled with rain water, or contain a ſmall quantity of vegetable earth, from whence a few odoriferous plants draw their nouriſhment. Some antelopes, howling baboons, ſolitary vultures, and toads, are ſometimes to be met with on the mountain. The view from thence is very extenſive and picturesque. The bay ſeems a little pond or baſon, and the ſhips in it dwindled to little boats; the town under our feet, and the regular compartments of its gardens, look like the work of children."

Moſt accounts of this country that have been publiſhed mention a ſurpriſing phenomenon which is annually to be ſeen on the top of Table-hill from September to March; namely, a white cloud hovering on its top, and called by ſailors *the Devil's table-cloth*. (See the article *Good-Hope*.) This cloud is ſaid by ſome to appear at firſt no bigger than a barley-corn; then increaſes to the ſize of a walnut, and ſoon after covers the whole top of the mount. But, according to Mr Kolben, it is never leſs, even on its firſt appearance, than the ſize of a large ox, often bigger. It hangs in ſeveral fleeces over the Table-hill and the Wind or Devil's-hill; which fleeces, at laſt uniting, form a large cloud that covers the ſummits of theſe two hills. After this has reſted for ſome time without change or motion, the wind burſts out ſuddenly from it with the utmoſt fury. The ſkirts of the cloud are white, but ſeem much more compact than the matter of common clouds; the upper parts are of a leaden colour. No rain falls from it, but ſometimes it diſcovers a great deal of humidity; at which times it is of a darker colour, and the wind iſſuing from it is broken, raging by fits of ſhort continuance. In its uſual ſtate, the wind keeps up its firſt fury unabated for one, two, three, or eight days; and ſometimes for a whole month together. The cloud ſeems all the while undiminiſhed, though little fleeces are from time to time detached, from it, and hurried down the ſides of the hills, vaniſhing when they reach the bottom, ſo that during the ſtorm the cloud ſeems to be ſupplied with new matter. When the cloud begins to brighten up, theſe ſupplies fail, and the wind proportionably abates. At length, the cloud growing tranſparent, the wind ceaſes. During the continuance of theſe ſouth-eaſt winds, the Table-valley is torn by furious whirlwinds. If they blow warm, they are generally of ſhort duration; and in this caſe the cloud ſoon diſappears. This wind rarely blows till after ſunſet, and never longer than till towards midnight, though the cloud remains; but then it is thin and clear: but when the wind blows cold, it is a ſure ſign that it will laſt for ſome time, an hour at noon and midnight excepted; when it ſeems to lie ſtill to recover itſelf, and then lets looſe its fury anew. Hottentots.

The Europeans at the Cape conſider the year as divided into two ſeaſons, which they term *monſoons*; the wet monſoon or winter, and the dry one or ſummer. The firſt begins with our ſpring in March; the latter with September, when our ſummer ends. In the ſummer monſoon reign the ſouth-eaſt winds already mentioned; which though they clear and render the air more healthy, yet make it difficult for ſhips outward bound to enter Table-bay. In the bad ſeaſon, the Cape is much ſubject to fogs; and the north-weſt winds and rain make the inhabitants ſtay much at home. But there are frequent intermiſſions and many clear days till June and July; when it rains almoſt continually, and from thence till ſummer. The weather in winter is cold, raw, and unpleaſant; but never more rigorous than autumn in Germany. Water never freezes to above the thickneſs of half a crown; and as ſoon as the ſun appears, the ice is diſſolved. The Cape is rarely viſited by thunder and lightning, excepting a little near the turn of the ſeaſons, which never does any hurt. During the continuance of the ſouth-eaſt winds which rage in ſummer, the ſky is free of all clouds except that on the Table and Wind Hills already mentioned; but during the north-weſt winds, the air is thick, and loaded with heavy clouds big with rain. If the ſouth-eaſt winds ſhould ceaſe for any length of time, the air becomes ſickly by reaſon of the ſea-weeds driving aſhore and rotting; hence the Europeans are at ſuch times affected with head-achs and other diſorders; but, on the other hand, the violence of thoſe winds ſubjects them to inflammation of their eyes, &c.

The natives of this country are called *Hottentots*, in their own language; a word of which it is vain to inquire the meaning, ſince the language of this country can ſcarce be learned by any other nation. The Hottentot language is indeed ſaid to be a compoſition of the moſt ſtrange and diſagreeable ſounds, deemed by many the diſgrace of ſpeech, without human ſound or articulation, reſembling rather the noiſe of irritated turkeys, the chattering of magpies, hooting of owls, and depending on extraordinary vibrations, inflections, and claſhings of the tongue againſt the palate.—If this account is true, however, it is obvious, that all the relations we have concerning the religion, &c. of the Hottentots derived from themſelves, muſt fall to the ground, as nobody can pretend to underſtand a language in itſelf unintelligible. The manners and cuſtoms of thoſe people, however, are eaſily obſervable, whether they themſelves give the relation or not; and if their language is conformable to them, it is no doubt of a nature ſufficiently wonderful.

Many accounts have been publiſhed concerning the extreme naſtineſs and filthy cuſtoms of the Hottentots; but from the obſervations of late travellers it appears, that theſe have either been exaggerated, or that the Hottentots (which is not improbable) have in ſome meaſure laid aſide their former manners. Dr Sparrman deſcribes them in much leſs diſguſtful terms, and M. Vaillant

Hottentots.

Vaillant ſeems to have been charmed with their innocence and ſimplicity. According to the doctor, theſe people are as tall as the generality of Europeans, though more ſlender in their perſons, which he attributes to their ſcanty ſupply of food, and not accuſtoming themſelves to hard labour. The characteriſtic of the nation, however, and which he thinks has not been obſerved by any one before, is, that they have ſmall hands and feet in proportion to the other parts of their body. The diſtance between the eyes appears greater than in Europeans, by reaſon of the root of the noſe being very low. The tip is pretty flat, and the iris of the eye has generally a dark-brown caſt, ſometimes approaching to black. Their ſkin is of a yellowiſh brown, ſomething like that of an European who has the jaundice in a high degree; though this colour does not in the leaſt appear in the whites of the eyes. Their lips are thinner than thoſe of their neighbours the *Negroes*, *Caffres*, or *Mozambiques*. "In fine (ſays our author), their mouths are of a middling ſize, and almoſt always furniſhed with a ſet of the fineſt teeth that can be ſeen; and, taken together with the reſt of their features, as well as their carriage, ſhape, and every motion, in ſhort their *tout enſemble* indicates health and delight, or at leaſt an air of *ſans ſouci*. This careleſs mien, however, diſcovers marks at the ſame time both of alacrity and reſolution; qualities which the Hottentots, in fact, can ſhow upon occaſion." The hair of the head is black and frizzled, though not very cloſe; and has ſo much the appearance of wool, that it would be taken for it, were it not for its harſhneſs. They have but ſeldom any appearance of a beard, or hair upon other parts of their bodies; and when any thing of this kind happens to be viſible, it is always very ſlight.

A general opinion has prevailed, that the Hottentot women have a kind of natural vail which covers the ſexual parts; but this is denied by our author. "The women (ſays he) have no parts uncommon to the reſt of their ſex: but the clitoris and nymphæ, particularly of thoſe who are paſt their youth, are pretty much elongated; a peculiarity which has undoubtedly got footing in this nation in conſequence of the relaxation neceſſarily produced by the method they have of beſmearing their bodies, their ſlothfulneſs, and the warmth of the climate."

The Hottentots beſmear all their bodies copiouſly with fat mixed up with a little ſoot. "This (ſays our author) is never wiped off; on the contrary, I never ſaw them uſe any thing to clean their ſkins, excepting that when in greaſing the wheels of their waggons, their hands were beſmeared with tar and pitch, they uſed to get it off very eaſily with cow-dung, at the ſame time rubbing their arms into the bargain up to the ſhoulders with this coſmetic; ſo that as the duſt and other filth, together with their ſooty ointment, and the ſweat of their bodies, muſt neceſſarily, notwithſtanding it is continually wearing off, in ſome meaſure adhere to the ſkin, it contributes not a little to conceal the natural hue of the latter, and at the ſame time to change it from a bright umber-brown to a browniſh-yellow colour, obſcured with filth and naſtineſs."—The doctor was enabled to diſcover the natural colour of the Hottentots by means of the nicety of ſome Dutch farmers wives, who had made their Hottentot girls waſh and ſcour their ſkins, that they might be leſs filthy in looking after the children, or doing any other work that required cleanlineſs. Many of the coloniſts, however, are of opinion, that this operation of waſhing is no improvement to the look of a Hottentot; but that their natural yellow is fully as diſagreeable as the black or brown colour of the ointment; and that the waſhed ſkin of a native of this country ſeems to be deficient in dreſs, like ſhoes that want blacking. This the doctor does not pretend to determine; though, whatever may be ſuppoſed deficient in look, we ſhould think muſt be made up in cleanlineſs.

The Hottentots perfume their bodies, by daubing them all over with the powder of an herb, the ſmell of which is at once rank and aromatic, approaching to that of the poppy mixed with ſpices. For this purpoſe they uſe various ſpecies of the dioſma, called by them *bucku*, and which they imagine to be very efficacious in the cure of diſorders. One ſpecies of this plant, growing about *Goud's river*, is ſaid to be ſo valuable, that no more than a thimble-full of its powder is given in exchange for a lamb.

By the ointment of ſoot and greaſe ſtuck full of the powder of *bucku*, a paſte is formed which defends the bodies of the Hottentots in a great meaſure from the action of the air; ſo that they require very few clothes, and in fact go almoſt quite naked. The only covering of the men conſiſts of two leather ſtraps, which generally hang down the back from the chine to the thighs, each of them in the form of an iſoſceles triangle, their points uppermoſt, and faſtened to a belt which goes round their waiſt, their baſes not being above three fingers broad; ſo that the covering they form is extremely trifling. Theſe ſtraps have very little dreſſing beſtowed upon them, ſo that they make a rattling noiſe as the Hottentot runs along; and our author ſuppoſes that they may produce an agreeable coolneſs by fanning him. Beſides this, the men have a bag or flap made of ſkin which hangs down before, and is faſtened to the belt already mentioned. The hollow part of this ſeems deſigned to receive that which with us modeſty requires to be concealed; but being only faſtened by a ſmall part of its upper end to a narrow belt, in other reſpects hanging quite looſe, it is but a very imperfect concealment; and when the wearer is walking, or otherwiſe in motion, it is none at all. They call this purſe by the Dutch name of *jackall*, it being almoſt always prepared of the ſkin of that animal, with the hairy ſide turned outwards.

The women cover themſelves much more ſcrupulouſly than the men, having always two, and very often three coverings like aprons; though even theſe ſeem to be abundantly ſmall for what we would term decency in this country. The outermoſt of theſe, which is the largeſt, meaſures only from about ſix inches to a foot in breadth. All of them are made of a ſkin well prepared and greaſed, the outermoſt being adorned with glaſs beads ſtrung in different figures. The outermoſt reaches about half-way down the thighs, the middle about a third or one half leſs, and the third ſcarcely exceeds the breadth of the hand. The firſt is ſaid to be deſigned for ornament, the ſecond as a defence for modeſty, and the third to be uſeful on certain occaſions, which, however, are much leſs troubleſome to the Hottentot than to the European females. Our author, with

Hottentots. with great probability, ſuppoſes that it was the ſight of this innermoſt apron which miſled the reverend Jeſuit Tackard, who, on his return to Europe, firſt propagated the ſtories concerning the natural vails or excreſcences of the Hottentots.—A ſtory was likewiſe commonly believed, that the men in general had but one teſticle, and that ſuch as were not naturally formed in this manner were artificially made ſo. But this our author likewiſe denies; and though he ſays that ſuch an operation might have been formerly performed upon the males, yet it is not ſo now.

The other garments worn by the Hottentots are formed of a ſheep's ſkin with the woolly ſide turned inwards; thus forming a kind of cloak, which is tied forwards over the breaſt: though ſometimes, inſtead of a ſheep's ſkin, ſome ſmaller kind of fur is uſed as a material. In warm weather they let this cloak hang careleſsly over their ſhoulders, ſo that it reaches down to the calves of the legs, leaving the lower part of the breaſt, ſtomach, and fore part of the legs and thighs bare; but in cold weather they wrap it round them; ſo that the fore-part of the body is likewiſe pretty well covered by it as far as the knees: But as one ſheep-ſkin is not ſufficient for this purpoſe, they ſew on a piece on the top at each ſide with a thong or catgut. In warm weather they ſometimes wear the woolly ſide outwards, but more frequently take off the cloak altogether, and carry it under their arm. This cloak or *kroſſe* ſerves them not only for clothes, but bedding alſo; and in this they lie on the bare ground, drawing up their bodies ſo cloſe, that the cloak is abundantly ſufficient to cover them.—The cloaks uſed by the women differ little from thoſe already deſcribed, excepting only that they have a long peak on them, which they turn up; forming with it a little hood or pouch, with the hairy ſide inwards. In this they carry their little children, to which the mother's breaſts are now and then thrown over the ſhoulders; a cuſtom common among ſome other nations, where the breaſts of the females, by continual want of ſupport, grow to an enormous length. The men commonly wear no covering on their heads, though our author ſays he has ſeen one or two who wore a greaſy night-cap made of ſkin with the hair taken off. Thoſe who live neareſt the coloniſts have taken a liking to the European hats, and wear them ſlouched all round, or with only one ſide turned up. The women alſo frequently go bare-headed; though they ſometimes wear a cap made in the ſhape of a ſhort truncated cone. This appears to be the ſection of ſome animal's ſtomach, and is perfectly blacked by ſoot and fat mixed up together. Theſe caps are frequently prepared in ſuch a manner as to look ſhaggy; others have the appearance of velvet; and in our author's apprehenſion are not inelegant. Over this they ſometimes wear an oval wreath or kind of crown made of a buffalo's hide, with the hair outermoſt. It is about four fingers breadth in height, and ſurrounds the head ſo as to go a little way down upon the forehead, and the ſame depth on the neck behind, without covering the upper part of the cap above deſcribed. The edges of this wreath, both upper and under, are always ſmooth and even; each of them ſet with a row of ſmall ſhells of the *cyprea* kind, to the number of more than 30, in ſuch a manner, that, being placed quite cloſe to one another, their beautiful white enamel, together with their mouths, are turned outwards. Between two rows of theſe ſhells run two others parallel, or elſe waved and indented in various ways. The Hottentots never adorn their ears or noſes as other ſavages do: though the latter are ſometimes marked with a black ſtreak of ſoot; at others, though more rarely, with a large ſpot of red lead; of which laſt, on feſtivals and holidays, they likewiſe put a little on their cheeks. The necks of the men are bare, but thoſe of the women are ornamented with a thong of undreſſed leather, upon which are ſtrung eight or ten ſhells. Theſe, which are about the ſize of beans, have a white ground, with large black ſpots of different ſizes: but as they are always made uſe of in a burniſhed ſtate, the doctor is uncertain whether they be of that kind which is received in the *Syſtema Naturæ* under the name of *nerita albicilla*, or *exuvia*. Theſe ſhells are ſold at an enormous price, no leſs than a ſheep for each; as it is ſaid that they come from the moſt diſtant coaſt of Caffraria. Both men and women are very fond of European beads, particularly the blue and white ones of the ſize of a pea; of which they tie ſeveral rows round the middle, and next to the girdles which hold the coverings above mentioned. Beſides theſe ornaments, they uſe rings on their arms and legs, moſt of them made of thick leather ſtraps generally cut in a circular ſhape; which, by being beat and held over the fire, are rendered tough enough to retain the curvature that is given them. From theſe rings it has been almoſt univerſally believed, that the Hottentots wrap guts about their legs in order to eat them occaſionally. The men wear from one to five or ſix of theſe rings on their arms, juſt above the wriſt, but ſeldom on their legs. The matrons of a higher rank have frequently a conſiderable number of them both on their arms and legs, eſpecially on the latter; ſo that they are covered with them from the feet up to the knees. Theſe rings are of various thickneſſes, from that of a gooſe quill to two or three times that ſize. Sometimes they are made of pieces of leather forming one entire ring; ſo that the arms and feet muſt be put through them when the wearer wiſhes to put them on. They are ſtrung upon the legs, ſmall and great, without any nicety; but are ſo large, that they ſhake and get twiſted when the perſon walks. Rings of iron or copper, but eſpecially of braſs, of the ſize of a gooſe-quill, are conſidered as more genteel than thoſe of leather. However, they are ſometimes worn along with the latter, to the number of ſix or eight at a time, particularly on the arms. The girls are not allowed to uſe any rings till they are marriageable. The Hottentots ſeldom wear any ſhoes; but ſuch as they do make uſe of are of the ſame form with thoſe worn by the African peaſants, by the Eſthonians, and Livonians, as well as by ſome Finlanders; ſo that it is impoſſible to ſay whether they are the invention of the Dutch or the Hottentots themſelves. They are made of undreſſed leather, with the hairy ſide outward; without any other preparation than that of being beat and moiſtened. If it be a thick and ſtout hide, as that of a buffalo, it is kept for ſome hours in cow-dung, which renders it beſides very ſoft and pliable. Some kind of greaſe is afterwards uſed for the ſame purpoſe. The ſhoes are then made in the following manner. They take a piece of leather, of a rectangu-

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lar form, ſomething longer and broader than the foot of the perſon for whom the ſhoes are intended; the two foremoſt corners are doubled up together, and ſewed down, ſo as to cover the fore-part of the foot; but this ſeam may be avoided, and the ſhoes made much neater at the toes, by fitting immediately over them a cap taken from the membrane in the knee-joint of the hind-leg of ſome animal. In order to make this piece of ſkin or leather riſe up to the height of an inch on both ſides of the foot, and cloſe it in neatly, it is pierced with holes at ſmall diſtances all round the edge, as far as the hind-quarters; and through theſe holes is paſſed a thong, by which the rim is drawn up into gathers. In order to make ſtrong hind-quarters, the back part of the piece of leather is doubled inwards, and then raiſed up and preſſed along the heel. The ends of the thong or gathering ſtring are then threaded on both ſides through the upper edge of the hind-quarters, to the height of about two inches; they are then carried forwards, in order to be drawn through two of the above-mentioned holes on the inſide of each rim. Laſtly, They are tied over the inſtep, or if it be thought neceſſary to tie the ſhoe ſtill faſter, they are carried croſswiſe over the inſtep, and ſo downwards under the thong, which comes out from the hind-quarters; then upwards again over the ancle, and even round the leg itſelf if the wearer chooſes. Shoes of this kind are not without their advantages: they fit as neat upon the foot as a ſtocking, and at the ſame time preſerve their form. They are eaſily kept ſoft and pliable by conſtantly wearing them; or if at any time they ſhould become ſomewhat hard, this is eaſily remedied by beating and greaſing them. They are extremely light and cool, by reaſon that they do not cover ſo much of the foot as a common ſhoe. They wear very well, as they are without any ſeam, and the ſoles of the ſhoes are both tough and yielding. Theſe field ſhoes, as they are called, being made of almoſt raw leather, are much more durable than thoſe of tanned leather, which are burnt up by the African ſands, and ſlip and roll about in them; being alſo very ready to be torn in a rocky ſoil, which is not the caſe with the others. The doctor is of opinion, that theſe ſhoes would be particularly uſeful to ſailors.

The huts of the Hottentots are built exactly alike; and we may readily give credit to our author when he tells us, that they are done in a ſtyle of architecture which does not a little contribute to keep envy from inſinuating itſelf under their roofs. Some of theſe huts are circular, and others of an oblong ſhape, reſembling a round bee-hive or vault; the ground-plot being from 18 to 24 feet in diameter. The higheſt are ſo low, that it is ſcarce ever poſſible for a middle-ſized man to ſtand upright even in the centre of the arch; "but (ſays our author) neither the lowneſs thereof, nor that of the door, which is but juſt three feet high, can perhaps be conſidered as any inconvenience to an Hottentot, who finds no difficulty in ſtooping and crawling upon all fours, and is at any time more inclined to lie down than to ſtand. The fire-place is in the middle of each hut, by which means the walls are not ſo much expoſed to danger from fire. From this ſituation of the fire-place alſo the Hottentots derive this additional advantage, that they can all ſit or lie in a circle round it, enjoying equally the warmth of the fire. The door, low as it is, alone lets in day-light or lets out the ſmoke: and ſo much are theſe people accuſtomed to live in ſuch ſmoky manſions, that their eyes are never affected by it in the leaſt, nor even by the mephitic vapour of the fuel, which to Europeans would be certain death.

The frame of the arched roof is compoſed of ſlender rods or ſprays of trees. Theſe being previouſly bent into a proper form, are laid, either whole or pieced, ſome parallel to one another, others croſswiſe; after which they are ſtrengthened by binding others round them in a circular form with withies. All theſe are taken principally from the *cliffortia conoides*, which grows plentifully in this country near the rivers. Large mats are then placed very neatly over this lattice work, ſo as perfectly to cover the whole. The aperture which is left for the door is cloſed occaſionally by a ſkin or piece of matting. Theſe mats are made of a kind of cane or reed in the following manner. The reeds being laid parallel to one another, are faſtened together with ſinews or catgut, or ſome kind of catgut which they have had an opportunity of getting from the Europeans; ſo that they have it in their power to make them as long as they pleaſe, and as broad as the length of the reeds, which is from ſix to ten feet. The coloniſts make uſe of the ſame kind of matting, next to the tilts of their waggons, to prevent the ſail-cloth from being rubbed and worn, and likewiſe to help to keep out the rain.

In a *kraal*, or Hottentot village, the huts are moſt commonly diſpoſed in a circle, with the doors inwards; by which means a kind of court-yard is formed, where the cattle are kept at nights. The milk, as ſoon as taken from the cow, is put to other milk which is curdled, and kept in a leather ſack with the hairy ſide inwards, as being the more cleanly; ſo that thus the milk is never drunk ſweet. In ſome northern diſtricts, where the land is dry and parched, both Hottentots and coloniſts are ſhepherds. When a Hottentot has a mind to ſhift his dwelling, he lays all the mats, ſkins, and rods, of which it is compoſed, on the backs of his cattle, which, to a ſtranger, makes a monſtrous, unwieldy, and even ridiculous appearance.

There is a ſpecies of Hottentots named *Boſhieſmen*, who dwell in the woody and mountainous parts, and ſubſiſt entirely by plunder. They uſe poiſoned arrows, which they ſhoot from bows about a yard long and an inch in thickneſs in the middle, very much pointed at both ends. Dr Sparrman does not know the wood of which they are made, but thinks that it is not very elaſtic. The ſtrings were made, ſome of ſinews, and others of a kind of hemp, or the inner bark of ſome vegetable; but moſt of them in a very ſlovenly manner. The arrows are about a foot and a half long, headed with bone and a triangular bit of iron; having alſo a piece of quill bound on very ſtrongly with ſinews, about an inch and a half from the top, in order to prevent it from being eaſily drawn out of the fleſh. The whole is laſtly covered over with a very deadly poiſon of the conſiſtence of an extract. Their quivers are two feet long and four inches in diameter; and are ſuppoſed by our author to be made of the branch of a tree hollowed out, or more probably of the bark of one of the branches taken off whole, the bottom and cover being made of leather.

 It

Hottentots.

It is daubed on the outſide with an unctuous ſubſtance which grows hard when dry, and is lined about the aperture with the ſkin of the yellow ſerpent, ſuppoſed to be the moſt deadly in all that part of the world. The poiſon they make uſe of is taken from the moſt venomous ſerpents; and, ignorant as the Hottentots are, they all know that the poiſon of ſerpents may be ſwallowed with ſafety. See the article BOSHIESMEN.

In the year 1779, Lieutenant William Paterſon, who took a long and dangerous excurſion from the Cape along the weſtern ſide of the continent, diſcovered a new tribe of Hottentots, whoſe living, he ſays, is in the higheſt degree wretched, and who are apparently the dirtieſt of all the Hottentot tribes. Their dreſs is compoſed of the ſkins of ſeals and jackals, the fleſh of which animals they feed upon. If a grampus happen to be caſt aſhore, they remove their huts to the place, and feed upon the carcaſe as long as it laſts, though perhaps it may be half rotten by the heat of the weather. They beſmear their ſkins with the oil; by which means they ſmell ſo exceedingly rank that their approach may be thus perceived before they come in ſight. Their huts, however, are much ſuperior to thoſe of the ſouthern Hottentots already deſcribed; being higher, thatched with graſs, and furniſhed with ſtools made of the back bones of the grampus. They dry their fiſh in the ſun; as the lieutenant found ſeveral kinds of fiſh near their huts ſuſpended from poles, probably for this purpoſe. He found alſo ſeveral aromatic plants which they had been drying.

With reſpect to the religion of the Hottentots, it does not appear that they have any. On being queſtioned on the ſubject of a Creator and Governor of the univerſe, they anſwer that they know nothing of the matter; nor do they ſeem willing to receive any inſtruction. All of them, however, have the moſt firm belief in the powers of magic; from whence it might be inferred that they believe in an evil being analogous to what we call *the devil;* but they pay no religious worſhip to him, though from this ſource they derive all the evil that happens, and among theſe evils they reckon cold, rain, and thunder. So monſtrouſly ignorant are they, that many of the coloniſts aſſured Dr Sparrman, that their Boſhieſmen would abuſe the thunder with many opprobrious epithets, and threaten to aſſault the flaſhes of lightning with old ſhoes, or any thing that comes firſt to hand. Even the moſt intelligent among them could not be convinced by all the arguments our author could uſe, that rain was not always an evil, and that it would be an unhappy circumſtance if it were never to rain. "A maxim (ſays he), from a race of men in other reſpects really endowed with ſome ſenſe, and frequently with no ſmall degree of penetration and cunning, ought, methinks to be conſidered as an indelible religious or ſuperſtitious notion entertained by them from their infancy, rather than as an idea taken up on due deliberation and conſequent conviction."

As the Hottentots have ſo ſtrong a belief in the powers of magic, it is no wonder that they have abundance of witches and conjurers among them. Theſe will readily undertake any thing, even to put a ſtop to thunder and rain, provided they be well paid for their pains; and if it happen to thunder or rain longer than the time they promiſed, they have always for an excuſe, that a more powerful conjurer has put a ſtop to their incantations. Many of the Hottentots believe that all diſorders incident to the human body are cured by magic. The wizards are fond of encouraging this idea; but at the ſame time take care to employ both external and internal remedies. Among the former may be reckoned a cure performed upon Captain Cook in ſome of the South-ſea iſlands, viz. that of pinching, cuffing, and kneading the whole body of the patient. To this, however, the Hottentot phyſicians add that of pretending to ſuck out a bone from ſome part of the patient's body. After this it ſometimes happens that the ſick perſon is relieved, and ſometimes not. In the latter caſe the operation is repeated; and if he dies, his friends lament that he was bewitched beyond the power of any one to aſſiſt him. Theſe conjurers appear to be poſſeſſed of conſiderable ſlight of hand. Our author was informed by a coloniſt, that when he was a child, and playing with a bone of an ox which he drew as a cart, it appeared to his great aſtoniſhment to be ſucked out of a ſick perſon's back by a wizard; and as far as he could remember, the patient recovered ſoon after. Theſe pretenſions of the wizards ſometimes render them liable to perſecutions; and there is an inſtance of a chief named *Paloo*, who ordered a general maſſacre among them, in hopes of cutting off the perſon who he believed had bewitched himſelf, and afflicted him with ſore eyes.

The ſuperſtition of the Hottentots never operates in the way of making them afraid in the dark. They ſeem, however, to have ſome ideas of a future ſtate, as they reproach their friends, when dead, with leaving them ſo ſoon: at the ſame time admoniſhing them from henceforth to demean themſelves properly: by which they mean, that their deceaſed friends ſhould not come back again and haunt them, nor allow themſelves to be made uſe of by wizards to bring any miſchief on thoſe that ſurvive them.

There is a genus of inſects (the *mantis*) which, it has been generally thought, the Hottentots worſhip; but our author is ſo far from being of this opinion, that he tells us they have more than once catched ſeveral of them for him, and aſſiſted him in ſticking pins through them as he did through other inſects. "There is (ſays he), however, a diminutive ſpecies of this inſect, which ſome think it would be a crime, as well as very dangerous, to do any harm to: but this we have no more reaſon to look upon as any kind of religious worſhip, than we have to conſider in the ſame light a certain ſuperſtitious notion prevalent among many of the more ſimple people in our own country (Sweden), who imagine that their ſins will be forgiven them, if they ſet a cock-chafer on its feet that has happened to fall upon its back. The moon, according to Kolbe, receives a kind of adoration from the Hottentots; but the fact is, that they merely take the opportunity of her beams, and at the ſame time of the coolneſs of the night, to amuſe themſelves with dancing, and conſequently have no more thoughts of worſhipping her than the Chriſtian coloniſts who are ſeen at that time ſtrolling in great numbers about the ſtreets, and parading on the ſtone ſteps with which their houſes are uſually encircled. The conjurers themſelves, according to our author, are generally freethinkers, who have neither religion nor ſuperſtition of any kind.

Lieutenant Paterſon has given the following account of the Caffres, a nation whom no European but himſelf has ever ſeen, and who inhabit the country to the north-eaſt of the Cape as far down as 31° ſouth latitude.

The men are from five feet ten inches to ſix feet high, and well proportioned; and in general manifeſt great courage in attacking lions or other wild beaſts. The nation, at the time he viſited them, was divided into two parties, one to the northward, commanded by a chief named *Cha Cha Bea*, or *Tambuſhie*, which latter appellation he had obtained from his mother, a woman of an Hottentot tribe named *Tambukies*. This man was the ſon of a chief named *Pharoa*, who died about three years before, and left two ſons *Cha Cha Bea*, and another named *Dſirika*, who claimed the ſupreme authority on account of his mother being of the Caffre nation. This occaſioned a conteſt between the two brothers, in the courſe of which *Cha Cha Bea* was driven out of his territories with a great number of his party; after which he took up his reſidence at a place named *Khouta*, where he had an opportunity of entering into an alliance with the Boſhies men.—The Caffres are of a jet black colour, their eyes large, and their teeth as white as ivory. The clothing of both ſexes is nearly the ſame; conſiſting entirely of the hides of oxen, which are made as pliant as cloth. The men wear tails of different animals tied round their thighs, pieces of braſs in their hair, and large rings of ivory on their arms: they are likewiſe adorned with the hair of lions, feathers faſtened on their heads, &c. They uſe the ceremony of circumciſion, which is uſually performed upon them when they are nine years of age. They are very fond of dogs, which they exchange for cattle, and will even give two bullocks in exchange for one dog which pleaſes them. They are expert in throwing lances, and in time of war uſe ſhields made of the hides of oxen. Throughout the day the men occupy themſelves in hunting, fighting, or dancing; the women being employed in the cultivation of their gardens and corn. They ſeem not to be deſtitute of the knowledge of agriculture, as they cultivate ſeveral vegetables which do not naturally grow in their own country, viz. tobacco, water-melons, a ſmall kind of kidney-beans, and hemp. The women alſo make their baſkets, and the mats on which they lie. The men are very fond of their cattle, and cut their horns in ſuch a manner as to be able to turn them into any ſhape they pleaſe, and teach them to anſwer to a whiſtle. Mr Paterſon is of opinion, that the country they inhabit is greatly ſuperior to any part of Africa.

Of the Dutch ſettlements and policy at the Cape, Mr Forſter gives the following account.

"The income of the governor here is very conſiderable; for, beſides a fixed appointment, and the uſe of houſes, gardens, proper furniture, and every thing that belongs to his table, he receives about 10 dollars for every leagre of wine which the company buy of the farmer in order to be exported to Batavia. The company allows the ſum of 40 dollars for each leagre, of which the farmer receives but 24: what remains is ſhared between the governor and ſecond or deputy; the former taking two-thirds, which ſometimes are ſaid to amount to 4000 dollars per annum. The deputy-governor has the direction of the company's whole commerce here, and ſigns all orders to the different departments under him, as well as the governor to others. He and the fiſcal have the rank of *upper koopman*. The fiſcal is at the head of the police, and ſees the penal laws put in execution: his income conſiſts of fines, and of the duties laid on certain articles of commerce; but if he be ſtrict in exacting them, he is univerſally deteſted. The ſound policy of the Dutch has likewiſe found it neceſſary to place the fiſcal as a check, to overawe the other officers of the company, that they may not counteract the intereſts of their maſters, or infringe the laws of the mother-country. He is, to that end, commonly well verſed in juridical affairs, and depends ſolely upon the mother-country. The major (at preſent Mr Von Prehn, who received us with great politeneſs) has the rank of *koopman* or merchant: this circumſtance ſurpriſes a ſtranger, who, in all other European ſtates, is uſed to ſee military honours confer diſtinction and precedence; and appears ſtill more ſingular to one who knows the contraſt in this particular between Holland and Ruſſia, where the idea of military rank is annexed to every place, even that of a profeſſor at the univerſity. The number of regular ſoldiers at this colony amounts to about 700, of which 400 form the garriſon of the fort, near the Cape-town. The inhabitants capable of bearing arms form a militia of 4000 men, of whom a conſiderable part may be aſſembled in a few hours, by means of ſignals made from alarm-places in different parts of the country. We may from hence make ſome eſtimate of the number of white people in this colony, which is at preſent ſo extenſive, that the diſtant ſettlements are above a month's journey from the Cape: but theſe remote parts lie ſometimes more than a day's journey from each other, are ſurrounded by various nations of Hottentots, and too frequently feel the want of protection from their own government at that diſtance. The ſlaves in this colony are at leaſt in the proportion of five or more to one white perſon. The principal inhabitants at the Cape have ſometimes from 20 to 30 ſlaves, which are in general treated with great lenity, and ſometimes become great favourites with their maſters, who give them very good clothing, but oblige them to wear neither ſhoes nor ſtockings, reſerving theſe articles to themſelves. The ſlaves are chiefly brought from Madagaſcar, and a little veſſel annually goes from the Cape thither on that trade; there are, however, beſides them, a number of Malays and Bengaleſe, and ſome negroes. The coloniſts themſelves are for the greateſt part Germans, with ſome families of Dutch and ſome of French Proteſtants. The character of the inhabitants of the town is mixed. They are induſtrious, but fond of good living, hoſpitable, and ſocial, though accuſtomed to hire their apartments to ſtrangers for the time they touch at this ſettlement, and uſed to be complimented with rich preſents of ſtuffs, &c. by the officers of merchant ſhips. They have no great opportunities of acquiring knowledge, there being no public ſchools of note at the Cape; their young men are therefore commonly ſent to Holland for improvement, and their female education is too much neglected. A kind of diſlike to reading, and the want of public amuſements, make their converſation unintereſting, and too frequently turn it upon ſcandal,

ſcandal, which is commonly carried to a degree of inveteracy peculiar to little towns. The French, Engliſh, Portugueſe, and Malay languages, are very commonly ſpoken, and many of the ladies have acquired them. This circumſtance, together with the accompliſhments of ſinging, dancing, and playing a tune on the lute, frequently united in an agreeable perſon, make amends for the want of refined manners and delicacy of ſentiment. There are, however, among the principal inhabitants, perſons of both ſexes, whoſe whole deportment, extenſive reading, and well-cultivated underſtanding, would be admired and diſtinguiſhed even in Europe. Their circumſtances are in general eaſy, and very often affluent, on account of the cheap rate at which the neceſſaries of life are to be procured: but they ſeldom amaſs ſuch prodigious riches here as at Batavia; and I was told the greateſt private fortune at the Cape did not exceed 100,000 dollars, or about 25,000l. ſterling.

"The farmers in the country are very plain hoſpitable people; but thoſe who dwell in the remoteſt ſettlements ſeldom come to town, and are ſaid to be very ignorant. This may eaſily be conceived, becauſe they have no better company than Hottentots, their dwellings being often ſeveral days journey aſunder, which muſt in a great meaſure preclude all intercourſe. The vine is cultivated in plantations within the compaſs of a few days journey from the town; which were eſtabliſhed by the firſt coloniſts, and of which the ground was given in perpetual property to them and their heirs. The company at preſent never part with the property of the ground, but let the ſurface to the farmer for an annual rent, which, though extremely moderate, being only 25 dollars for 60 acres, yet does not give ſufficient encouragement to plant vineyards. The diſtant ſettlements, therefore, chiefly raiſe corn and rear cattle; nay, many of the ſettlers entirely follow the latter branch of ruſtic employment, and ſome have very numerous flocks. We were told there were two farmers who had each 15,000 ſheep, and oxen in proportion; and ſeveral who poſſeſſed 6000 or 8000 ſheep, of which they drive great droves to town every year; but lions and buffaloes, and the fatigue of the journey, deſtroy numbers of their cattle before they can bring them ſo far. They commonly take their families with them in large waggons covered with linen or leather, ſpread over hoops, and drawn by 8, 10, and ſometimes 12 pair of oxen. They bring butter, mutton-tallow, the fleſh and ſkins of river-hroſes (hippopotamus), together with lion and rhinoceros ſkins to ſell. They have ſeveral ſlaves, and commonly engage in their ſervice ſeveral Hottentots of the poorer ſort, and (as we are told) of the tribe called BOSHIESMEN, *Boſchemans*, or *Buſhmen*, who have no cattle of their own, but commonly ſubſiſt by hunting, or by committing depredations on their neighbours. The opulent farmers ſet up a young beginner by intruſting to his care a flock of 400 or 500 ſheep, which he leads to a diſtant ſpot, where he finds plenty of good graſs and water; the one-half of all the lambs which are yeaned fall to his ſhare, by which means he ſoon becomes as rich as his benefactor.

"Though the Dutch company ſeem evidently to diſcourage all new ſettlers, by granting no lands in private property; yet the products of the country have of late years ſufficed not only to ſupply the iſles of France and Bourbon with corn, but likewiſe to furniſh the mother-country with ſeveral ſhip loads. Theſe exports would certainly be made at an eaſier rate than at preſent, if the ſettlements did not extend ſo far into the country, from whence the products muſt be brought to the Table-bay by land-carriage, on roads which are almoſt impaſſable. The intermediate ſpaces of uncultivated land between the different ſettlements are very extenſive, and contain many ſpots fit for agriculture; but one of the chief reaſons why the coloniſts are ſo much divided and ſcattered throughout the country, is to be met with in another regulation of the company, which forbids every new ſettler to eſtabliſh himſelf within a mile of another. It is evident, that if this ſettlement were in the hands of the commonwealth, it would have attained to a great population, and a degree of opulence and ſplendor of which it has not the leaſt hopes at preſent; but a private company of Eaſt India merchants find their account much better in keeping all the landed property to themſelves, and tying down the coloniſt, leſt he ſhould become too great and powerful.

"The wines made at the Cape are of the greateſt variety poſſible. The beſt, which is made at M. Vander Spy's plantation of Conſtantia, is ſpoken of in Europe, more by report than from real knowledge; 30 leagres (or pipes) at the utmoſt are annually raiſed of this kind, and each leagre ſells for about 50l. on the ſpot. The vines from which it is made were originally brought from Shiraz in Perſia. Several other ſorts grow in the neighbourhood of that plantation, which produce a ſweet rich wine, that generally paſſes for genuine Conſtantia in Europe. French plants of burgundy, muſcade, and frontignan, have likewiſe been tried, and have ſucceeded extremely well, ſometimes producing wines ſuperior to thoſe of the original ſoil. An excellent dry wine, which has a ſlight agreeable tartneſs, is commonly drank in the principal families, and is made of Madeira vines tranſplanted to the Cape. Several low ſorts, not entirely diſagreeable, are raiſed in great plenty, and ſold at a very cheap rate; ſo that the ſailors of the Eaſt India ſhips commonly indulge themſelves very plentifully in them whenever they come aſhore.

"The products of the country ſupply with proviſions the ſhips of all nations which touch at the Cape. Corn, flour, biſcuit, ſalted beef, brandy, and wine, are to be had in abundance, and at moderate prices; and their freſh greens, fine fruits, good mutton and beef, are excellent reſtoratives to ſeamen who have made a long voyage."

HOTTINGER, JOHN HENRY, one of the moſt learned and eminent of the Proteſtant divines of Switzerland, was born at Zurich, in the year 1620. He diſcovered an invincible propenſity to learning at a very early period, and acquired the knowledge of languages with aſtoniſhing facility. The truſtees of the ſchools had their attention attracted towards Hottinger by his amazing progreſs in the knowledge of the Hebrew, Greek, and Latin, whom they determined to ſend to foreign univerſities at the public expence. In 1638 he ſtudied for a ſhort time at Geneva under the celebrated Spanheim, and went afterwards to France. He next viſited Holland and Flanders, and became a ſtudent

dent in the university of Groningen, where he attended the theological lectures of the renowned Francis Gomar, and Professor Alting, and studied the Arabic language under Professor Pasor. Being anxious, however, to enjoy still more advantages than this situation afforded, he went to Leyden, where he became tutor to the children of Professor Golius, whose knowledge of oriental languages was at that time unrivalled. By his instructions and those of a Turk then at Leyden, Hottinger's knowledge of the Arabic became very extensive, and Golius allowed him to copy many of the Arabic manuscripts which he had in his possession. In 1641 he was chosen chaplain to the embassy of the states-general to Constantinople; but the magistrates of Zurich would not allow him to accept of it, resolving that his talents should be exerted for the glory and benefit of their own public schools. They permitted him to visit England prior to his return home, where he contracted habits of intimacy with some of the most distinguished literary characters. As soon as he returned to Zurich, he was appointed professor of church-history, when no more than 22 years of age, and when 23, he was chosen professor of catechetical divinity and oriental languages. About this period he married, and began his career as an author, in which he persevered for twenty years, with the most astonishing industry. In 1653 he was appointed professor of rhetoric, and professor extraordinary of the divinity of the Old Testament, and controversial theology.

So justly celebrated about this time was Hottinger as a man of uncommon erudition, that his aid was earnestly requested by the elector palatine, to restore the fame of the university of Heidelberg. The magistrates of Zurich consented to lend him for three years. At Heidelberg he was made professor of divinity, principal, ecclesiastical counsellor, and rector. He wrote in favour of the re-union of Lutherans and Calvinists; but he had no better success than all his predecessors in the same attempt. He continued at Heidelberg, by permission of the magistrates of Zurich, till 1661. On his return home, he was chosen president of the commissioners who were appointed to revise the German translation of the Bible. He was requested to accept of professorships from the magistrates of Deventer, the landgrave of Hesse, and the magistrates of Amsterdam and Bremen; but the love of his country made him reject the whole. He was offered the divinity chair at Leyden in 1667, but the magistrates would not part with him. This made the Dutch request him as a loan, to which the magistrates agreed, from their respect for the states of Holland; but while making preparations for his departure, he was unfortunately drowned in the river which runs through Zurich, while on his way to an estate of his own about six miles from that city.

Dr Hottinger was a man of extraordinary abilities, both natural and acquired, having few equals for his knowledge of oriental languages, and the antiquities of the church. He had a most retentive memory, and his literary industry was almost unexampled. His life was comparatively short, being only 47 when he found a watery grave, yet he was the author of no fewer than 40 volumes, on different subjects. He is frequently inaccurate, owing to the astonishing rapidity with which he wrote. For a correct list of his publications, see *Heidegger's Life of Hottinger*.

HOTTONIA, WATER-VIOLET, a genus of plants belonging to the pentandria class; and in the natural method ranking under the 21st order, *Precia*. See BOTANY *Index*.

HOUBRAKEN, JACOB, a celebrated engraver, whose great excellence consisted in the portrait line. His works are distinguished by an admirable softness and delicacy of execution, joined with good drawing and a fine taste. If his best performances have ever been surpassed, it is in the masterly determination of the features, which we find in the works of Nanteuil, Edelink, and Drevet; this gives an animation to the countenance, more easily to be felt than described. His works are pretty numerous; and most of them being for English publications, they are sufficiently known in this country. In particular the greater and best part of the collection of portraits of illustrious men, published in London by I. and P. Knapton, were by his hand.

HOVEDON, ROGER DE, born of an illustrious family in Yorkshire, most probably at the town of that name, now called *Howden*, some time in the reign of Henry I. After he had received the first parts of education in his native country, he studied the civil and canon law, which were then become most fashionable and lucrative branches of learning. He became domestic chaplain to Henry II. who employed him to transact several ecclesiastical affairs; in which he acquitted himself with honour. But his most meritorious work was his annals of England, from A. D. 731, when Bede's ecclesiastical history ends, to A. D. 1202. This work, which is one of the most voluminous of our ancient histories, is more valuable for the sincerity with which it is written, and the great variety of facts which it contains, than for the beauty of its style, or the regularity of its arrangement.

HOUGH, HAM, in the manege, the joint of the hind leg of a beast, which connects the thigh to the leg. See HAM.

To HOUGH, or *cut the Houghs*, is to ham-string, or to disable by cutting the sinews of the ham.

HOULIERES, ANTONIETTE DES, a French lady, whose poetry is highly esteemed in France. Her works and those of her daughter have been collected and printed together in two volumes. Most of the idyls, particularly those on sheep and birds, surpass every thing of the kind in the French language: the thoughts and expressions are noble; and the style pure, flowing, and chaste. Mademoiselle des Houlieres carried the poetic prize in the French academy against Fontenelle. Both of these ladies were members of the academy of Ricovatri; the mother was also a member of the academy of Arles. Those who desire to be more particularly acquainted with the history of Madame des Houlieres, may consult her life prefixed to her works in the Paris edition of 1747, 2 vols 12mo.

HOULSWORTHY, a large town of Devonshire, seated between two branches of the river Tamer, having a good market for corn and provisions. W. Long. 4. 42. N. Lat. 50. 50.

HOUND. See CANIS, *BLOOD-Hound*, and *GRE-Hound*.

Training

Hound.

Training of Hounds. Before we ſpeak of the methods proper to be uſed for this purpoſe, it will be neceſſary to point out the qualities which ſportſmen deſire to meet with in theſe animals. It is generally underſtood, that hounds of the middle ſize are the moſt proper, it being remarked, that all animals of that deſcription are ſtronger than either ſuch as are very ſmall or very large. The ſhape of the hound ought to be particularly attended to; for if he be not well proportioned, he can neither run faſt nor do much work. His legs ought to be ſtraight, his feet round, and not very large; his ſhoulders back; his breaſt rather wide than narrow; his cheſt deep, his back broad, his head ſmall, his neck thin; his tail thick and buſhy, and if he carry it well ſo much the better. None of thoſe young hounds which are *out at the elbows*, or ſuch as are weak from the knee to the foot, ſhould ever be taken into the pack. That the pack may look well, it is proper that the hounds ſhould be as much as poſſible of a ſize: and if the animals be handſome at the ſame time, the pack will then be perfect. It muſt not, however, be thought, that this contributes any thing to the *goodneſs* of a pack; for very unhandſome packs, conſiſting of hounds entirely different in ſize and colour, have been known to afford very good ſport. It is only neceſſary that they ſhould run well together; to which indeed an uniformity in ſize and ſhape would ſeem to contribute in ſome degree. The pack that can run 10 miles, or any other conſiderable ſpace, in the ſhorteſt time, may be ſaid to go faſteſt, though the hounds taken ſeparately might be conſiderably inferior to others in ſwiftneſs. A pack of hounds, conſidered in a collective body, go faſt in proportion to the excellence of their noſes and the head they carry. Packs which are compoſed of hounds of various kinds ſeldom run well. When the packs are very large, the hounds are ſeldom ſufficiently hunted to be good; 20 or 30 couple, therefore, or at moſt 40, will be abundantly ſufficient for the keeneſt ſportſman in this country, as thus he may be enabled to hunt three or even four times a-week. The number of hounds to be kept muſt, however, in a conſiderable degree, depend on the ſtrength of the pack, and the country in which you hunt. They ſhould be left at home as ſeldom as poſſible; and too many old hounds ſhould not be kept. None ought to be kept above five or ſix ſeaſons, though this alſo is ſomewhat uncertain, as we have no rule for judging how long a hound will laſt.

In breeding of hounds, conſiderable attention ought to be paid to the dog from whom you breed. All ſuch are to be rejected as have a tender noſe, as are *babblers* or *ſkirters*. An old dog ſhould never be put to an old bitch; nor ſhould any attempts be made to croſs the breed unleſs in a proper and judicious manner. Mr Beckford * informs us, that he has ſeen fox-hounds bred out of a Newfoundland dog and fox-hound bitch; the whelps were monſtrouſly ugly, and had other bad qualities beſides. The croſs moſt likely to be of ſervice to a fox-hound is the beagle. The reaſon of croſſing the breeds ſometimes is, that the imperfections of one may ſometimes be remedied by another. The months of January, February, and March, are the beſt for breeding; late puppies ſeldom thrive. After the females begin to grow big with young, it will not be proper to let them hunt any more, or indeed to remain for a much longer time in the kennel. Sometimes theſe animals will have an extraordinary number of whelps. Mr Beckford informs us, that he has known a bitch have 15 puppies at a litter; and he aſſures us, that a friend of his informed him, that a hound in his pack brought forth 16, all of them alive. In theſe caſes it is proper to put ſome of the puppies to another bitch, if you want to keep them all; but if any are deſtroyed, the beſt coloured ought to be kept. The bitches ſhould not only have plenty of fleſh, but milk alſo; and the puppies ſhould not be taken from them till they are able to take care of themſelves; their mothers will be relieved when they learn to lap milk, which they will do in a ſhort time. After the puppies are taken away from the mothers, the litter ſhould have three purging balls given them, one every other morning, and plenty of whey the intermediate day. If a bitch bring only one or two puppies, and you have another that will take them, by putting the puppies to her the former will ſoon be fit to hunt again. She ſhould, however, be firſt phyſicked, and it will alſo be of ſervice to anoint her dugs with brandy and water.

* *Eſſay on Hunting.*

Whelps are very liable to the diſtemper to which dogs in general are ſubject, and which frequently makes great havock among them at their walks; and this is ſuppoſed by Mr Beckford to be owing to the little care that is taken of them. "If the diſtemper (ſays he) once get among them, they muſt all have it: yet, notwithſtanding that, as they will be conſtantly well fed, and will lie warm (in a kennel built on purpoſe), I am confident it would be the ſaving of many lives. If you ſhould adopt this method, you muſt remember to uſe them early to go in couples: and when they become of a proper age, they muſt be walked out often; for ſhould they remain confined, they would neither have the health, ſhape, or underſtanding, which they ought to have. When I kept harriers, I bred up ſome of the puppies at a diſtant kennel; but having no ſervants there to exerciſe them properly, I found them much inferior to ſuch of their brethren as had the luck to ſurvive the many difficulties and dangers they had undergone at their walks; theſe were afterwards equal to any thing, and afraid of nothing; whilſt thoſe that had been nurſed with ſo much care, were weakly, timid, and had every diſadvantage attending private education. I have often heard as an excuſe for hounds not hunting a cold ſcent, that they were too *high-bred.* I confeſs I know not what that means: but this I know, that hounds are frequently too *ill-bred* to be of any ſervice. It is judgment in the breeder, and patience afterwards in the huntſman, that makes them hunt.

"When young hounds are firſt taken in, they ſhould be kept ſeparate from the pack; and as it will happen at a time of the year when there is little or no hunting, you may eaſily give them up one of the kennels and graſs court adjoining. Their play frequently ends in a battle; it therefore is leſs dangerous where all are equally matched.—If you find that they take a diſlike to any particular hound, the ſafeſt way will be to remove him, or it is probable they will kill him at laſt. When a feeder hears the hounds quarrel in the kennel, he halloos to them to ſtop them; he then goes in among them, and flogs every hound he can come near.

2

How

How much more reasonable, as well as efficacious, would it be, were he to see which were the combatants before he speaks to them. Punishment would then fall, as it ought, on the guilty only. In all packs there are some hounds more quarrelsome than the rest; and it is to them we owe all the mischief that is done. If you find chastisement cannot quiet them, it may be prudent to break their holders; for since they are not necessary to them for the meat they have to eat, they are not likely to serve them in any good purpose. Young hounds should be fed twice a-day, as they seldom take kindly to the kennel meat at first, and the distemper is most apt to seize them at this time. It is better not to round them till they are thoroughly settled; nor should it be put off till the hot weather, for then they will bleed too much. It may be better perhaps to round them at their quarters, when about six months old; should it be done sooner, it would make their ears tuck up. The tailing of them is usually done before they are put out; it might be better, perhaps, to leave it till they are taken in. Dogs must not be rounded at the time they have the distemper upon them, as the loss of blood would weaken them too much.

"If any of the dogs be thin over the back, or any more quarrelsome than the rest, it will be of use to cut them; I also spay such bitches as I shall not want to breed from; they are more useful, are stouter, and are always in better order; besides it is absolutely necessary if you hunt late in the spring, or your pack will be very short for want of it. The latter operation, however, does not always succeed; it will be necessary therefore to employ a skilful person, and one on whom you can depend; for if it be ill done, though they cannot have puppies, they will go to heat notwithstanding. They should be kept low for several days before the operation is performed, and must be fed on thin meat for some time after."

It is impossible to determine how many young hounds ought to be bred in order to keep up the pack, as this depends altogether on contingencies. The deficiencies of one year must be supplied by the next; but it is probable, that from 30 to 35 couple of old hounds, and from eight to twelve couple of young ones, will answer the purpose where no more than 40 couple are to be kept. A considerable number, however, ought always to be bred; for it is undoubtedly and evidently true, that those who breed the greatest number of hounds must expect the best pack.

After the hounds have been rounded, become acquainted with the huntsman, and answer to their names, they ought to be coupled together, and walked out among sheep. Such as are particularly ill-natured ought to have their couples loose about their necks in the kennel till they become reconciled to them. The most stubborn ought to be coupled to old hounds rather than to young ones; and two dogs should not be coupled together when you can avoid it. As young hounds are awkward at first, a few ought only to be set out at a time with people on foot, and they will soon afterwards follow a horse. When they have been walked out often in this manner amongst the sheep, they should be uncoupled by a few at a time, and those chastised who offer to run after the sheep; but it will be difficult to reclaim them after they have once been allowed to taste blood. Some are accustomed to couple the dogs with a ram in order to break them from sheep; but this is very dangerous for both parties. Mr Beckford relates a story of a nobleman who put a large ram into his kennel in order to break his hounds from sheep; but when he came some time after to see how nobly the ram defended himself, he found him entirely eaten up, and the hounds gone to sleep after having filled their bellies.

When hounds are to be aired, it is best to take them out separately, the old ones one day, and the young another; though, if they are to have whey from a distant dairy, both old and young may be taken out together, observing only to take the young hounds in couples, when the old ones are along with them. Young hounds are always apt to fall into mischief, and even old ones when idle will be apt to join them. Mr Beckford mentions a whole pack running after a flock of sheep through the mere accident of a horse's falling, and then running away.

With regard to the first entering of hounds to a scent, our author gives such directions as have subjected him to a severe charge of inhumanity. We shall give them in his own words. "You had better enter them at their own game; it will save you much trouble afterwards. Many dogs, I believe, like that scent best which they were first blooded to: but be this as it may, it is most certainly reasonable to use them to that which it is intended they should hunt. It may not be amiss first when they begin to hunt to put light collars on them. Young hounds may easily get out of their knowledge; and shy ones, after they have been much beaten, may not choose to return home. Collars, in that case, may prevent their being lost.—You say you like to see your young hounds run a trail-scent.—I have no doubt that you would be glad to see them run over an open down, where you could so easily observe their action and their speed. I cannot think the doing of it once or twice could hurt your hounds; and yet as a sportsman I dare not recommend it to you. All that I can say is, that it would be less bad than entering them at hare. A cat is as good a trail as any; but on no account should any trail be used after your hounds are stooped to a scent. I know an old sportsman who enters his young hounds first at a cat, which he drags along the ground for a mile or two, at the end of which he turns out a badger, first taking care to break his teeth: he takes out about a couple of old hounds along with the young ones to hold them on. He never enters his young hounds but at vermin; for he says, Train up a child in the way he should go, and when he is old he will not depart from it."

Hounds ought to be entered as soon as possible, though the time must be uncertain, as it depends on the nature of country in which they are. In corn countries hunting may not be practicable till the corn is cut down; but you may begin sooner in grass countries, and at any time in woodlands. "If (says Mr Beckford) you have plenty of foxes, and *can afford to make a sacrifice of some of them* for the sake of making your young hounds steady, take them first where you have least riot, putting some of the steadiest of your old hounds among them. If in such a place you are fortunate enough to find a litter of foxes, you may assure yourself you will have but little trouble with your

your young hounds afterwards.—If, owing to a ſcarcity of foxes, you ſhould ſtoop your hounds at hare, let them by no means have the blood of her; nor, for the ſake of conſiſtency, give them much encouragement. Hare-hunting has one advantage;——hounds are chiefly in open ground, where you can eaſily command them; but notwithſtanding that, if foxes be in tolerable plenty, keep them to their own game.——Frequent hallooing is of uſe with young hounds; it keeps them forward, prevents their being loſt, and hinders them from hunting after the reſt. The oftener therefore that a fox is ſeen and hallooed, the better. I by no means, however, approve of much hallooing to old hounds; though it is true that there is a time when hallooing is of uſe, a time when it does hurt, and a time when it is perfectly indifferent: but long practice and great attention to hunting can only teach the application.

"Hounds at their firſt entrance cannot be encouraged too much. When they are become handy, love a ſcent, and begin to know what is right, it will then be ſoon enough to chaſtiſe them for what is wrong; in which caſe one ſevere beating will ſave a great deal of trouble. When a hound is flogged, the whipper-in ſhould make uſe of his voice as well as his whip. If any be very unſteady, it will not be amiſs to ſend them out by themſelves when the men go out to exerciſe their horſes. If you have hares in plenty, let ſome be found ſitting, and turned out before them; and you will find that the moſt riotous will not run after them. If you intend them to be ſteady from deer, they ſhould often ſee deer, and then they will not regard them; and if after a probation of this kind you turn out a cub before them, with ſome old hounds to lead them on, you may aſſure yourſelf they will not be unſteady long."

It is proper to put the young hounds into the pack when they ſtoop to a ſcent, become handy, know a rate, and ſtop eaſily. A few only are to be put to the pack at a time; and it is not adviſable even to begin this till the pack have been out a few times by themſelves, and "are gotten well in blood." They ſhould be low in fleſh when you begin to hunt; the ground being generally hard at that time, ſo that they are liable to be ſhaken.—By hounds being *handy*, our author means their being ready to do whatever is required of them; and particularly, when caſt, to turn eaſily which way the huntſman pleaſes.

Mr Beckford begins to hunt with his young hounds in Auguſt. The huntſman in the preceding months keeps his old hounds healthy by giving them proper exerciſe, and gets his young hounds forward; and for this purpoſe nothing anſwers ſo well as taking them frequently out. The huntſman ſhould go along with them, get frequently off his horſe, and encourage them to come to him:—too much reſtraint will frequently incline the hounds to be riotous. Our author frequently walks out his hounds among ſheep, hares, and deer. Sometimes he turns down a cat before them, which they kill; and, when the time of hunting approaches, he turns out young foxes or badgers; taking out ſome of the moſt ſteady of his old hounds to lead on the young ones. Small covers and furze-brakes are drawn with them to uſe them to a halloo, and to teach them obedience. If they find improper game and hunt it, they are ſtopped and brought back; and as long as they will ſtop at a rate, they are not chaſtiſed. At ſuch times as they are taken out to air, the huntſman leads them into the country in which they are deſigned to hunt; by which means they acquire a knowledge of the country, and cannot miſs their way home at any time afterwards. When they begin to hunt, they are firſt brought into a large cover of his own, which has many ridings cut in it; and where young foxes are turned out every year on purpoſe for them. After they have been hunted for ſome days in this manner, they are ſent to more diſtant covers, and more old hounds added to them. There they continue to hunt till they are taken into the pack, which is ſeldom later than the beginning of September; for by that time they will have learned what is required of them, and ſeldom give much trouble afterwards. In September he begins to hunt in earneſt; and after the old hounds have killed a few foxes, the young ones are put into the pack, two or three couple at a time, till all have hunted. They are then divided; and as he ſeldom has occaſion to take in more than nine or ten couple, one half are taken out one day, and the other the next, till they are ſteady.

To render fox-hunting complete, no young hounds ſhould be taken into the pack the firſt ſeaſon; a requiſite too expenſive for moſt ſportſmen. The pack ſhould conſiſt of about 40 couple of hounds, that have hunted one, two, three, four, or five ſeaſons. The young pack ſhould conſiſt of about 20 couple of young hounds, and an equal number of old ones. They ſhould have a ſeparate eſtabliſhment, and the two kennels ſhould not be too near one another. When the ſeaſon is over, the beſt of the young hounds ſhould be taken into the pack, and the draught of old ones exchanged for them. Many muſt be bred to enable a ſportſman to take in 20 couple of young hounds every ſeaſon. It will always be eaſy to keep up the number of old hounds; for when your own draft is not ſufficient, drafts from other packs may be obtained, and at a ſmall expence. When young hounds are hunted together for the firſt ſeaſon, and have not a ſufficient number of old ones along with them, it does more harm than good.

Kennel of Hounds. See Kennel.

HOUNSLOW, a town of Middleſex, 10 miles from London. It is ſituated on a heath of the ſame name; and belongs to two pariſhes, the north ſide of the ſtreet to Heſton, and the ſouth ſide to Iſleworth. It is ſituated on the edge of a heath of the ſame name, and near it are powder-mills. It has fairs on Trinity-Monday, and Monday after September 29. Here is a charity-ſchool and a chapel. In this place was formerly a convent of mendicant friars, who, by their inſtitution, were to beg alms for the ranſom of captives taken by the infidels.—The heath is noted for robberies and horſe-races.

HOU-QUANG, a province of China, occupying nearly the centre of the empire: the river Yang-tſe-kiang traverſes it from weſt to eaſt; and divides it into two parts, the northern and ſouthern. This province (the greater part of which is level, and watered by lakes, canals, and rivers) is celebrated for its fertility; the Chineſe call it the ſtore-houſe of the empire; and it is a common ſaying among them, that "the abundance

dance of Kiang-si could furnish all China with a breakfast; but the province of Hou-quang alone could supply enough to maintain all its inhabitants." Some princes of the race of Hong-vou formerly resided in this province; but that family was entirely destroyed by the Tartars when they conquered China. The people here boast much of their cotton cloths, simples, gold-mines, wax, and paper made of the bamboo-reed. The northern part of the province contains eight *fou*, or cities of the first class, and sixty of the second and third. The southern comprehends seven of the first class, and fifty-four of the second and third, exclusive of sorts, towns, and villages, which are everywhere to be found.

HOUR, in chronology, an aliquot part of a natural day, usually a 24th, but sometimes a 12th. The origin of the word *hora*, or ὡρα, comes, according to some authors, from a surname of the sun, the father of hours, whom the Egyptians call *Horus*. Others derive it from the Greek ὁριζειν, to *terminate*, *distinguish*, &c. Others from the word ὑρον, *urine*; holding, that Trismegistus was the first that settled the division of hours which he did from observation of an animal consecrated to Serapis, named *cynocephalus*, which makes water 12 times a-day, and as often in the night, at equal intervals.

An hour, with us, is a measure or quantity of time, equal to a 24th part of the natural day, ornychthemeron; or the duration of the 24th part of the earth's diurnal rotation. Fifteen degrees of the equator answer to an hour; though not precisely, but near enough for common use. It is divided into 60 minutes; the minute into 60 seconds, &c.

The division of the day into hours is very ancient; as is shown by Kircher, *Oedipt. Ægypt.* tom. ii. p. ii. class. vii. c. 8.: though the passages he quotes from Scripture do not prove it.—The most ancient hour is that of the 12th part of the day. Herodotus, lib. ii. observes, that the Greeks learnt from the Egyptians, among other things, the method of dividing the day into twelve parts.—The astronomers of Cathaya, &c. Bishop Beveridge observes, still retain this division. They call the hour *chag;* and to each chag give a peculiar name, taken from some animal: The first is called *zeth*, "mouse;" the second, *chiu*, "bullock;" the third, *zem*, "leopard;" the fourth, *mau*, "hare;" the fifth, *chiu*, "crocodile," &c.

The division of the day into 24 hours, was not known to the Romans before the first Punic war.—Till that time they only regulated their days by the rising and setting of the sun. They divided the 12 hours of their day into four, viz. *prime*, which commenced at six o'clock; *third*, at nine; *sixth*, at twelve, and *none*, at three. They also divided the night into four watches, each containing three hours.

HOURS, HORÆ, in the ancient mythology, were certain goddesses, the daughters of Jupiter and Themis; at first only three in number, Eunomia, Dice, and Irene, to which were afterwards added two more, Carpo and Thallote.

Homer makes them the doorkeepers of heaven. Ovid allots them the employment of harnessing the horses of the Sun:

Jungere equos Titan velocibus imperat Horis.

And speaks of them as standing, at equal distances, about the throne of Sol:

——*et, positæ spatiis equalibus*, Horæ.

The poets represent them as dressed in fine coloured or embroidered robes, and gliding on with a quick and easy motion.

HOURS, *Horæ*, in the Romish church, are certain prayers performed at stated times of the day; as matins, vespers, lauds, &c. The lesser hours are, *prime*, *tierce*, *sixth*, and *none*. They are called *hours*, or *canonical hours*, as being to be rehearsed at certain hours prescribed by the canons of that church, in commemoration of the mysteries accomplished at those hours. These hours were anciently also called *course*, *cursus:* F. Mabillon has a dissertation on them, entitled, *De Cursu Gallicano*.

The first constitution enjoining the observation of the canonical *hours* is of the ninth century, being found in a capitular of Heito bishop of Basil directed to his curates, importing that the priests shall never be absent at the canonical hours either by day or night.

Hour-Glass, a popular kind of chronometer or clepsydra, serving to measure the flux of time by the descent or running of sand out of one glass vessel into another. The best hour-glasses are those which, instead of sand, have egg-shells well dried in the oven, then beaten fine and sifted.—Hour-glasses are much used at sea for reckoning, &c.

HOURIS, in modern history, is a name given by the Mahometans to those females that are designed for the faithful in Paradise. These are not the same with whom they have lived on earth, but formed for this purpose with singular beauty and undecaying charms.

HOUSE, a habitation, or place built with conveniencies for dwelling in. See ARCHITECTURE.

HOUSES, among the Jews, Greeks, and Romans, were flat on the top for them to walk upon, and had usually stairs on the outside, by which they might ascend and descend without coming into the house. Each house, in fact, was so laid out, that it enclosed a quadrangular area or court. This court was exposed to the weather, and being open to the sky, gave light to the house. This was the place where company was received, and for that purpose it was strewed with mats or carpets for their better accommodation. It was paved with marble or other materials, according to the owner's ability, and provided with an umbrella of vellum to shelter them from the heat and inclemencies of the weather. This part of their houses, called by the Romans *impluvium*, or *cava ædium*, was provided with channels to carry off the water into the common sewers. The top of the house was level, and covered with a strong plaster by way of terrace. Hither, especially amongst the Jews, it was customary to retire for meditation, private converse, devotion, or the enjoyment of the evening breezes.

The Grecian houses were usually divided into two parts, in which the men and women had distinct mansions assigned. The part assigned to the men was towards the gate, and called ανδρωνιτις; the apartment of the women was the farthest part of the house, and called γυναικωνιτις. Jews, Greeks, and Romans, suppofed their houfes to be polluted by dead bodies, and to ftand in need of purification.

House is alfo ufed for one of the eftates of the kingdom of Britain affembled in parliament. Thus we fay, the houfe of lords, the houfe of commons, &c. See Peers, Commons. &c.

House is alfo ufed for a noble family, or a race of illuftrious perfons iffued from the fame ftock. In this fenfe we fay, the houfe or family of the Stuarts, the Bourbons, the houfe of Hanover, of Auftria, of Lorrain, of Savoy, &c.

Cheap, eafy, and expeditious Method of conftructing Houses, *which have been found to be very ufeful hofpitals for the recovery of the fick, and therefore may probably make very wholefome places of refidence for the healthy.*—The firft thing to be done is to choofe a dry and airy fituation, on a gravelly or chalky foil if poffible; upon this lay down the plan of your building, make one end of it face that quarter from whence the pureft and healthieft winds may be expected to blow, of a breadth that can be conveniently roofed. Then, if boarding does not come fo cheap, drive ftakes, at about 6 feet diftance from each other, into the ground, fo as to ftand about fix feet above it; and, interlacing them with wattles, coat the wattles on the fide next the weather with frefh ftraw; and make the roof in the fame manner, but thicker, or of thatch in the ufual way, with a hole at the very top of it, to open occafionally. Let the end of the building facing the wholefomeft quarter lie open fome feet back, fo as to form a porch, where the convalefcents may take the air without danger of any injury from the weather. A large chimney and kitchen grate may be erected at the other end. If the foil happens to be chalky or gravelly, you may hollow it four or five feet deep, within a foot or eighteen inches of the walls; but let the fteps into this hollow lie far enough within the porch, that no water may get into it, and, if of chalk, the fteps may not grow flippery in wet weather. From time to time open the vent-hole at the roof; by means of which all the unwholefome infectious air, as being warmer, and confequently lighter, than that which is pure and wholefome, will be driven out by the rufhing in of the frefh air; a purpofe, which the little openings that may be left in the fides and roofs of fuch rude and hafty buildings, will, even of themfelves, anfwer fo well, as fufficiently to compenfate any cold they may let in, even in the coldeft months. Let the floor likewife be fcraped three or four inches deep every five or fix days, and what comes off removed to fome diftance. Halls of this kind, 50 feet long and 20 broad, coft but a trifle to build; yet, with thefe precautions (even without the addition of clean ftraw for every new patient to lie on, inclofed in clean wafhed facks fit for the purpofe, which come infinitely cheaper than the bare cleaning of flock or even feather-beds, fuppofing it poffible to wafh fuch beds), proved of infinitely more advantage in the recovery of fick foldiers, than the low-roofed rooms of the farm-houfes of the Ifle of Wight, or even the better accommodations of Carifbrooke caftle in the fame ifland, in which there perifhed four times the number of fick that there did in thefe temporary receptacles; which were firft thought of by Doctor Brocklefby, on occafion of fome terrible infections from confined animal effluvia.

Is it not furprifing, that we have not availed ourfelves more of the above difcovery in natural hiftory, being, perhaps, the moft important the moderns can boaft of, in the moft ufeful fcience, viz. the fuperior lightnefs of unwholefome and infectious air! The upper fafhes in moft houfes, even of thofe who pretend to fome knowledge in thefe matters, are generally immoveable, by means of which no part of the foul air above the level of the loweft rail of the other fafh's greateft rife can efcape by the window; and, if it efcapes by the doors, it is generally for want of a vent in the higheft part of the roof, merely to accumulate in the upper ftory of the houfe, and add to the infection, which the great quantities of old furniture ufually ftored up there are of themfelves but too apt to create, when care is not frequently taken to open the windows of it. Thus, the chief benefit to be expected from lofty rooms is in a great meafure loft. Whereas, were the upper fafhes contrived to come down, all the air might be eafily changed, and that almoft infenfibly, by letting them down an inch or two. Nay, the upper fafh might be often let entirely down with lefs danger or inconvenience from cold, than the lower thrown up the tenth part of an inch, though the doing of the former would be attended with infinitely more advantage to the health of the inhabitants than the latter. It is, perhaps, on this principle, that we are to account for the good health enjoyed by the poor who live crowded in damp cellars, and often with great numbers of rabbits, poultry, and even fwine about them. Thefe cellars are open to the ftreet, with doors reaching from the floor to the very ceiling, but never fo clofe at bottom or at top as to prevent a free circulation of air; in confequence of which, that all-vivifying fluid, as faft as it is fpoiled by paffing through the lungs of the inhabitants and their ftock, or is infected by their infenfible perfpiration, excrements, &c. is driven out and replaced by the frefh air.

House, in aftrology, denotes the twelfth part of the heavens.

The divifion of the heavens into houfes, is founded upon the pretended influence of the ftars, when meeting in them, on all fublunary bodies. Thefe influences are fuppofed to be good or bad; and to each of thefe houfes particular virtues are affigned, on which aftrologers prepare and form a judgment of their horofcopes. The horizon and meridian are two circles of the celeftial houfes, which divide the heavens into four equal parts, each containing three houfes; fix of which are above the horizon and fix below it; and fix of thefe are called *eaftern* and fix *weftern houfes*.

A fcheme or figure of the heavens is compofed of 12 triangles, all called *houfes*, in which are marked the ftars, figns, and planets, fo included in each of thefe circles. Every planet has likewife two particular houfes, in which it is pretended that they exert their influence in the ftrongeft manner; but the fun and moon have only one, the houfe of the former being Leo, and that of the latter Cancer.

The houfes in aftrology have alfo names given them according to their qualities. The firft is the houfe of

life:

life: this is the afcendant, which extends five degrees above the horizon, and the reft below it. The fecond is the houfe of riches; the third, the houfe of brothers; the fourth, in the loweft part of the heavens, is the houfe of relations, and the angle of the earth; the fifth, the houfe of children; the fixth, the houfe of health; the feventh, the houfe of marriage, and the angle of the weft; the eighth, the houfe of death; the ninth, the houfe of piety; the tenth, the houfe of offices; the eleventh, the houfe of friends; and the twelfth, the houfe of enemies.

Country House, is the *villa* * of the ancient Romans, the *quinta* of the Spaniards and Portuguefe, the *closerie* and *caffine* of the French, and the *vigna* of the Italians.

* See *Villa*.

It ought always to have wood and water near it, thefe being the principal beauties of a rural feat. The trees make a far better defence than hills, as they yield a cooling and healthy air, fhade during the heat of fummer, and very much break the feverities of the winter feafon.

It fhould not be fituated too low, on account of the moifture of the air; and, on the other hand, thofe built on places expofed to the winds are expenfive to keep in repair. In houfes not above two ftories high, and upon a good foundation, the length of two bricks, or 18 inches, for the heading courfe, will be fufficient for the ground-work of any common ftructure; and fix or feven courfes above the earth, to a water-table, where the thicknefs of the walls is abated or taken in, on either fide the thicknefs of a brick, viz. two inches and a quarter. But for large and high houfes of three, four, or five ftories, with garrets, their walls ought to be three heading courfes of bricks, or 28 inches at leaft, from the foundation to the firft water-table; and at every ftory a water-table, or taking in, on the infide, for the fummers, girders, and joifts to reft upon, laid into the middle, or one quarter of the wall at leaft, for the better bond. But as for the partition-wall, a brick and half will be fufficiently thick; and for the upper ftories a brick length or nine inch brick will fuffice.

Hot-House. See STOVE and HYPOCAUSTUM.

House-Breaking, or *Robbing*, is the breaking into and robbing a houfe in the day-time; the fame crime being termed BURGLARY when done by night: both are felony without benefit of clergy.

House and Window Duty, a branch of the king's extraordinary revenue †.—As early as the conqueft, mention is made in domefday book of fumage or fugage, vulgarly called *fmoke-farthings*; which were paid by cuftom to the king for every chimney in the houfe. And we read that Edward the Black Prince (foon after his fucceffes in France), in imitation of the Englifh cuftom, impofed a tax of a florin upon every hearth in his French dominions. But the firft parliamentary eftablifhment of it in England was by ftatute 13 and 14 Car. II. c. 10. whereby an hereditary revenue of 2s. for every hearth, in all houfes paying to church and poor, was granted to the king for ever. And, by fubfequent ftatutes, for the more regular affeffment of this tax, the conftable and two other fubftantial inhabitants of the parifh, to be appointed yearly (or the furveyor appointed by the crown, together with fuch conftable or other public officer), were, once in every year, empowered to view the infide of every houfe in the parifh. But, upon the Revolution, by ftat. 1. W. and M. c. 10. hearth-money was declared to be "not only a great oppreffion to the poorer fort, but a badge of flavery upon the whole people, expofing every man's houfe to be entered into and fearched at pleafure, by perfons unknown to him; and therefore, to erect a lafting monument of their majefties goodnefs, in every houfe in the kingdom the duty of hearth-money was taken away and abolifhed." This monument of goodnefs remains among us to this day: but the profpect of it was fomewhat darkened, when in fix years afterwards, by ftatute 7 W. III. c. 18. a tax was laid upon all houfes (except cottages) of 2s. now advanced to 3s. per houfe, and a tax alfo upon all windows, if they exceeded nine, in fuch houfe. Thefe rates have been from time to time varied, being now extended to all windows exceeding fix; and power is given to furveyors, appointed by the crown, to infpect the outfide of houfes, and alfo to pafs through any houfes, two days in the year, into any court or yard, to infpect the windows there.

† See *Revenue*.

Schemes of the different rates of duty upon houfes and windows may be feen in the *Almanacks*, or in *Kearfley's Tax-Tables* publifhed yearly.

House-Leek. See SEVUM and SEMPERVIVUM, BOTANY *Index*.

HOUSEHOLD, the whole of a family confidered collectively, including the miftrefs, children, and fervants. But the houfehold of a fovereign prince includes only the officers and domeftics belonging to his palace.

The principal officers of his majefty's houfehold are, the lord fteward, lord chamberlain of the houfehold, the groom of the ftole, the mafter of the great wardrobe, and the mafter of the horfe.

The civil government of the king's houfe is under the care of the lord fteward of the king's houfehold; who, being the chief officer, all his commands are obferved and obeyed. His authority extends over all the other officers and fervants, except thofe of his majefty's chapel, chamber, and ftable, and he is the judge of all crimes committed either within the court or the verge.

Under him are the treafurer of the houfehold, the comptroller, cofferer, the mafter of the houfehold, the clerks of the green-cloth, and the officers and fervants belonging to the accounting-houfe, the marfhalfea, the verge, the king's kitchen, the houfehold kitchen, the acatery, bake-houfe, pantry, buttery, cellar, paftry, &c. Next to the lord fteward is the lord-chamberlain of the houfehold, who has under him the vice-chamberlain, the treafurer, and comptroller of the chamber; 48 gentlemen of the privy chamber, 12 of whom wait quarterly, and two of them lie every night in the privy-chamber; the pages of the prefence-chamber; the macebearers, cup-bearers, carvers, muficians, &c. See *Lord Chamberlain of the Houfehold*.

The groom of the ftole has under him the 11 other lords of the bed-chamber, who wait weekly in the bedchamber, and by turns lie there a-nights on a palletbed; and alfo the grooms of the bed-chamber, the pages of the bed-chamber and back-ftairs, &c. See *Groom of the Stole*.

The mafter or keeper of the great wardrobe has under

der him a deputy, comptroller, clerk of the robes, brufher, &c. and a number of tradefmen and artificers, who are all fworn fervants to the king.

The mafter of the horfe has under his command the equerries, pages, footmen, grooms, coachmen, farriers, faddlers, and all the other officers and tradefmen employed in his majefty's ftables.

Next to the civil lift of the king's court, is the military, confifting of the band of gentlemen penfioners the yeomen of the guards, and the troops of the houfehold; of which the two firft guard the king above ftairs.

When the king dines in public, he is waited upon at table by his majefty's cup-bearers, carvers, and gentlemen fewers; the muficians playing all the time. The dinner is brought up by the yeomen of the guard, and the gentlemen fewers fet the difhes in order. The carvers cut for the king, and the cup-bearer ferves him the drink with one knee on the ground, after he has firft tafted it in the cover.

HOUSING, or *House-Line*, in the fea-language, a fmall line, formed of three fine ftrands or twifts of hemp, fmaller than rope-yarn. It is chiefly ufed to feize blocks into their ftrops, to bind the corners of the fails, or to faften the bottom of a fail to its bolt-rope, &c. See *Bolt-Rope*.

Housing, or *Houfee*, a cover laid over the faddle of a horfe, in order to fave it from the weather, dirt, &c. The word is formed of the French *houffe*, which fignifies the fame thing; though it anciently denoted a kind of hood worn by country people.—The cavaliers appeared with their embroidered houfings.

Housing, among bricklayers, a term ufed for a brick which is warped, or is caft crooked or hollow in burning; in fuch a cafe, they fay it is *houfing*.

HOUSSA, the metropolis of an empire in Africa, on the banks of the Niger, the population of which, according to the account of an Arab named *Shabeni*, which he delivered to the African Affociation, was only equalled by that of London and Cairo. The fame perfon defcribed the government as a limited monarchy, which adminiftered juftice in a fevere manner, although in conformity to written laws. The rights of landed property are guarded by the inftitutions of particular hereditary officers, whofe duties imply no ordinary degree of refinement and civilization. The merchants of Houffa have been celebrated for their probity, while the ladies are faid not to be very remarkable for their conjugal fidelity. The art of writing is common, but their alphabet is entirely different from the Arabic and Hebrew. Thefe obfervations appear to be confirmed by the teftimony of Mr Park; and to fuch as may be difpofed to doubt the poffibility of fo much refinement in the interior of a country deemed favage, it will be neceffary to obferve, that many of the Carthaginians may have retired to the fouthern parts of Africa, on the deftruction of their own cities, and carried with them fome portion of the arts, fciences, and commercial knowledge, for the knowledge of which we are affured that their anceftors were once fo famous. According to fome maps of North Africa, particularly that of Major Rennel, the city of Houffa lies in Lat. 16. 20. N. and Long. 4. 30. E.

HOUSTONIA, a genus of plants belonging to the tetrandria clafs, and in the natural method ranking under the 47th order, *Stellatæ*. See Botany *Index*.

HOU-TCHEOU-fou, a city of China, in the province of Tche-kiang. It is a city of the firft clafs; and is fituated on a lake, from which it takes its name. The quantity of filk manufactured here is almoft incredible. To give fome idea of it we fhall only fay, that the tribute paid by a city under its jurifdiction, named *Te-tfin-hien*, amounts to more than 500,000 *taels* or ounces of filver. Its diftrict contains feven cities, one of which is of the fecond, and fix of the third, clafs.

HOUZOUANAS, a wandering people, whofe country, according to M. Vaillant, is fituated between 16° and 29° E. Long. but in what latitude appears to be unknown, although it is extremely probable that it commences about the 23d parallel, and ftretches towards the north a confiderable way. It is the opinion of the above-mentioned author, that the Houzouanas are the origin of all the eaftern and weftern tribes of the Hottentots: and as to the Houzouanas themfelves, they feem wholly ignorant of their own origin; for when they are interrogated upon this fubject, their anfwer invariably is, that they live in the country which their anceftors inhabited, which in point of information is no anfwer at all. They have been often confounded by the planters with the Bofhmen, who are not a diftinct people, but a band of fugitives and freebooters. The Houzouanas have nothing in common with them, and only form alliances among themfelves. So great are their courage and habits of plunder, that all furrounding nations are afraid of them, and even the very Hottentots, according to Vaillant, tremble to enter their territories. They are often guilty of fhedding human blood, yet this does not appear to originate from an innate love of carnage, but merely for the purpofe of making juft reprifals.

They furvey the adjacent countries from the fummits of their mountains, and make incurfions to carry off cattle or flaughter them upon the fpot; but although they rob, they never kill, except in their own defence, or by way of retaliation, fo that they are by no means the unrelenting cannibals which fome have reprefented them. Like the Arabs, who are alfo plunderers, they adhere with unfhaken fidelity to their engagements, and the traveller who puts himfelf under their protection by civilly purchafing their fervices, may reft affured of being defended to the laft drop of their blood; which is more than can be faid for the people of many countries profeffing to be civilized.

Amidft all this fuperiority to the other natives of Southern Africa, their ftature is low, fo that a perfon among them meafuring five feet four inches in height, is confidered as very tall;—a proof that intellectual excellence is not always to be met with in men of a gigantic ftature. Their complexion is not fo black as that of the Hottentots, but their heads are rounder towards the chin. The heat of the climate renders clothing unneceffary, and the conftant habit of going naked, makes them equally indifferent to the burning fands of the level country, or the froft and fnow of the lofty mountains. They have no weapons but bows and arrows, in the ufe of which they difcover remarkable dexterity. Their huts appear as if cut vertically through the middle, fo that it would require two of them exactly

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ly to make one of the Hottentots. The Houzouanas are remarkably nimble, considering the climbing of mountains as nothing more than an amusement; and they conducted M. Vaillant, that traveller informs us, over such tremendous precipices as the Hottentots would have deemed wholly impassable. The practice of making signals by means of nocturnal fires, is known in all savage countries; but the Houzouanas are said to display such uncommon sagacity and prudence in the arrangement and variations of position from time to time, as to render it impossible for the surrounding tribes to penetrate their designs.

HOWARD, Henry, earl of Surrey, a soldier and a poet, the son and grandson of two lord treasurers, dukes of Norfolk, was born probably about the year 1520, and educated in Windsor castle, with young Fitzroy earl of Richmond, natural son to King Henry VIII. Wood says, from tradition, that he was some time a student at Cardinal College, Oxford. In his youth he became enamoured of the Fair Geraldine, whom his sonnets have immortalized. In 1532, Howard with his companion Richmond was at Paris, where they continued some time. The latter died in 1536, after which our young hero made a tour to Italy, and at Florence, like a true *enamorata*, published a challenge against all comers, whether Christians, Jews, Saracens, Turks, or cannibals, in defence of the beauty of his fair Geraldine; and was victorious in the tournament instituted by the grand duke on the occasion. The duke, we are told, was so charmed with his gallant exploits, that he would gladly have retained him at his court; but he rejected the invitation, being determined to maintain the superlative beauty of his Geraldine in all the principal cities in Italy. This romantic resolution was however frustrated by the command of his sovereign, Henry VIII. to return to England.

In 1540, he signalized himself in a tournament at Westminster, against Sir John Dudley, Sir Thomas Seymour and others. In 1542, he marched, under the command of his father, against the Scots; and in the same year was confined in Windsor castle for eating flesh in Lent, contrary to the king's proclamation. In 1544, on the expedition to Boulogne in France, he was appointed field-marshal of the English army; and after the taking of that town, in 1546, made captain-general of the king's forces in France. He was at this time knight of the garter. In the same year, attempting to intercept a convoy, he was defeated by the French, and soon after superseded in his command by the earl of Hertford.

Surrey, after his return to England, conscious of his former services, and peevish under his disgrace, could not help reflecting on the king and council. This was his first step towards destruction. He had married Frances, the daughter of John earl of Oxford; and, after her death, is said to have made love to the princess Mary. For this the Seymours, rivals of the Norfolk family, and now in favour with the king, accused him of aspiring to the crown, adding, that he already presumed to quarter part of the royal arms with his own: but, whatever might be the pretence, the cause of his ruin was the jealousy and power of his enemies. In short, the destruction of the Howards being determined, Surrey, and his father, the duke of Norfolk, were committed to the Tower, in December 1546; and on the 13th of January following, Surrey was tried at Guildhall by a common jury, and beheaded on Tower-hill on the 19th day of the same month, nine days before the death of the king; who thus, that the measure of his crimes might be full, finished his life with the murder of his best subject. The accusations brought against this amiable and innocent young nobleman on his trial, were so extremely ridiculous, that one is astonished how it was possible, even in the most despotic reign, to find a judge and jury so pusillanimously villanous as to carry on the farce of justice on the occasion. We boast of our excellent constitution, and our trial by juries; but this example may teach us, that our constitution and our juries are not incompatible with despotic monarchy. He was first interred in the church of All-hallows, Barkin, near Tower-hill; and afterwards in the reign of King James I. removed to Farmingham in Suffolk, by his son Henry earl of Northampton.

As to the character of this unfortunate earl, all our poets have sung his praise. Mr Walpole begins his anecdotes of Surrey with these words: "We now emerge from the twilight of learning to an almost classic author, that ornament of a boisterous, yet not unpolished court, the earl of Surrey, celebrated by Drayton, Dryden, Fenton, Pope, illustrated by his own muse, and lamented for his unhappy death: a man (as Sir Walter Raleigh says) no less valiant than learned, and of excellent hopes." Leland calls him the conscript enrolled heir of Sir Thomas Wyatt, the elder, in his learning and other excellent qualities; and the author of *The Art of English Poetry* says, that the earl of Surrey, and Sir Thomas Wyatt, may be justly called the *reformers of our poetry and style*. His poems were published in 1557, 12mo; and in 1565, 1574, 1585, 1587, 8vo. Several of the sonnets are by Sir Thomas Wyatt and others.

HOWARD, *Charles*, an able statesman and experienced seaman, was the son of Lord William Howard, baron of Effingham, and born in 1536. He served under his father, who was lord high admiral of England, till the accession of Queen Elizabeth. In January 1573, he succeeded his father in his title and estate: after which he successively became chamberlain of the household and knight of the garter; and in 1585 was made lord high admiral, at that critical juncture when the Spaniards were sending their ARMADA, in their opinion, to the assured conquest of this kingdom. When he received intelligence of the approach of the Spanish fleet, and saw the prodigious consequence it was to get out the few ships that were ready at Plymouth, he not only gave orders in every thing himself, but wrought also with his own hands, and the first night left the port with six ships. The next morning, though he had only 30 sail, and those the smallest of the fleet, he attacked the Spanish navy; but first dispatched his brother-in-law, Sir Edward Hobby, to the queen, to desire her to make the proper disposition of her land-forces for the security of the coast, and to hasten as many ships as possible to his assistance. His valour was conspicuously displayed in his repeated attacks of a superior enemy. The coolness of his temper was no less conspicuous; and it was owing to his magnanimity and prudence that the victory was so great. The queen expressed

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expressed her sense of his merit in the most honourable terms; and granted him a pension for life. In 1596, he commanded in chief at sea, as Essex did by land, the forces sent against Spain, when his prudence and moderation were among the principal causes of the success the English met with in that great and glorious enterprise; so that, upon his return the next year, he was advanced to the dignity of earl of Nottingham. The next eminent service in which his lordship was engaged was in 1599, when the Spaniards seemed to meditate a new invasion. Her majesty, who always placed her safety in being too quick for her enemies, drew together, in a fortnight's time, such a fleet, and such an army, as took away all appearance of success from her foreign and domestic enemies; and she gave the earl the sole and supreme command of both the fleet and army, with the title of *lord lieutenant general of all England*, an office unknown in succeeding times. When age and infirmity had unfitted him for action, he resigned his office, and spent the remaining part of his life in ease and retirement, till the time of his decease, which happened in 1624, in the 87th year of his age.

HOWARD, *John*, Esq; a man of singular and transcendant humanity, was the son of a reputable tradesman in St Paul's church-yard. He was born about the year 1725 or 1726; and at a proper age was put apprentice to Mr Nathaniel Newnham, a wholesale grocer in Watling street. His father died, leaving only this son and a daughter, to both of whom he bequeathed handsome fortunes; and by his will directed that his son should not be considered of age till he was five and twenty. His constitution was thought very weak, and his health appeared to have been injured by the necessary duties of his apprenticeship; and therefore, at the expiration of it, he took an apartment in a lodging house in Church-street, Stoke Newington, Middlesex; but not meeting with the tenderest treatment there, he removed to another lodging-house in the same street, which was kept by a widow lady Mrs Sarah Lardeau, a worthy sensible woman, but an invalid. Here he was nursed with so much care and attention, that he resolved to marry his landlady out of gratitude for her kindness. In vain she expostulated with him upon the extravagance of such a proceeding, he being about 28 and she about 51 years of age, and 20 years older in constitution: but nothing could alter his resolution, and they were privately married about the year 1752. She was possessed of a small fortune, which he presented to her sister. During his residence at Newington, the minister of the dissenting meeting-house there resigned his office, and a successor was elected; and Mr Howard, who was bred a dissenter, and stedfastly adhered all his life to that profession, proposed to purchase the lease of a house near the meeting-house, and to appropriate it as a parsonage-house for the use of the minister for the time being, and contributed 50l. for that purpose. His wife died November 10. 1755, aged 54; and he was a sincere and affectionate mourner for her death. About this time it is believed, he was elected F. R. S. In the year 1756 he had the fortune to experience some of the evils which it afterwards became the business of his life to redress. He embarked that year in a Lisbon packet, the Hanover, in order to make the tour of Portugal; when the vessel was taken by a French privateer. "Before we reached Brest (says he *) I suffered the extremity of thirst, not having for above 40 hours one drop of water, nor hardly a morsel of food. In the castle at Brest I lay six nights upon straw; and observing how cruelly my countrymen were used there and at Morlaix, whither I was carried next, during the two months I was at Carhaix upon parole, I corresponded with the English prisoners at Brest, Morlaix, and Dinnan: at the last of those towns were several of our ship's crew, and my servant. I had sufficient evidence of their being treated with such barbarity, that many hundreds had perished, and that 36 were buried in a hole at Dinnan in one day. When I came to England, still on parole, I made known to the commissioners of sick and wounded seamen the sundry particulars, which gained their attention and thanks. Remonstrance was made to the French court: our sailors had redress; and those that were in the three prisons mentioned above, were brought home in the first cartel ships.—Perhaps (adds Mr Howard) what I suffered on this occasion increased my sympathy with the unhappy people whose case is the subject of this book."

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* *On Prisons*, 4to, 1784, p. 11.

He afterwards, it is said, made the tour of Italy; and at his return settled at Brokenhurst, a retired and pleasant villa in the New Forest, near Lymington in Hampshire, having, April 25. 1758, married a daughter of Edward Leeds, Esq; of Croxton, Cambridgeshire, king's serjeant. This lady died in 1765 in childbed, of her only child, a son, who unfortunately became lunatic. After her death Mr Howard left Lymington, and purchased an estate at Cardington, near Bedford.

"While he lived here in retirement (says Mr Palmer †), it was his meat and drink to make his neighbours happy. His neat but humble mansion was ever hospitable to a few select friends, but was never the scene of riot or luxurious banqueting. Though polite to all, he neither sought nor admitted the company of the profligate, however distinguished by rank or fortune.—His charity had no bounds, except those of prudence; and was not more commendable for the extent of it, than for the manner in which it was exercised. He gave not his bounty to countenance vice and idleness, but to encourage virtue and industry. He was singularly useful in furnishing employment for the labouring poor of both sexes, at those seasons when a scarcity of work rendered their situation most compassionable. And at other times, though never inattentive to the tale of wo, he was not easily imposed upon by it, but made himself acquainted with the case. He had indeed a general acquaintance with the cases and characters of the poor around him, and made it his business to visit the abodes of affliction. In circumstances of bodily disorder, he often acted the part of a physician as well as a friend. But his kindness was not confined to the bodies of his fellow-creatures, it extended to their spiritual and immortal part. He carefully watched over the morals of his neighbourhood, and used his advice, his admonitions, and influence, to discountenance immorality of all kinds, and to promote the knowledge and practice of religion. As a most effectual means to this great end, he provided for the instruction of poor children, by erecting and supporting schools which he carefully superintended. In short, he was an universal blessing to the vil-

† *Funeral Sermons on the death of Mr Howard.*

lage

lage where he resided, in every part of which are to be seen the pleasing monuments of his munificence and taste.—His liberality extended also to adjacent places, in which there are many who will call him blessed. Nor was it confined to persons of his own religious persuasion, but comprehended the necessitous and deserving of all parties; while he was particularly useful in serving the interest of the Christian society to which he belonged. What wonder if such a man were universally beloved? Was it possible he should have an enemy? One however he had (and I never heard of more), an idle and dissolute wretch, who, having been often reproved by him for his vices, formed the desperate resolution to murder him as he was going to public worship, which he almost always did on foot. But providence remarkably interposed to preserve so valuable a life, by inclining him that morning to go on horseback a different road."

But the sphere in which he had hitherto moved was too narrow for his enlarged mind. Being named in 1773 to the office of sheriff of Bedfordshire, from that time his scene of usefulness was extended. His office, as he himself observes, brought the distress of prisoners more immediately under his notice. A sense of duty induced him personally to visit the county-jail, where he observed such abuses and such scenes of calamity, as he had before no conception of; and he soon exerted himself in order to a reform. With a view to obtain precedents for certain regulations which he proposed, he went to inspect the prisons in some neighbouring counties. But finding in them equal room for complaint and commiseration, he determined to visit the principal prisons in England. The farther he proceeded, the more shocking were the scenes presented to his view: which induced him to resolve upon exerting himself to the utmost, in order to a general reform in these horrid places of confinement; considering it as of the highest importance, not only to the wretched objects themselves, but to the community at large. Upon this subject he was examined in the house of commons in March 1774, when he had the honour of their thanks. This encouraged him to proceed in his design. He revisited all the prisons in the kingdom, together with the principal houses of correction. He also in 1775 enlarged his circuit by going into Wales, Scotland, and Ireland, where he found the same need of reformation.

One grand object which he had in view was, to put a stop to that shocking distemper called the *jail-fever*; which raged so dreadfully in many of the prisons, as to render them to the last degree offensive and dangerous: A distemper, by which more had been taken off than by the hands of the executioner; and which, in several instances, had been communicated from the prisons into the courts of justice, and had proved fatal to the magistrates and judges, and to multitudes of persons who attended the trials, as well as to the families of discharged felons and debtors. Another end he proposed was, to procure the immediate release of prisoners, who, upon trial, were acquitted, but who often continued long to be unjustly detained for want of being able to pay the accustomed fees: As also to abolish many other absurd and cruel usages which had long prevailed. But the great object of all was, to introduce a thorough reform of morals into our prisons; where he had found the most flagrant vices to prevail in such a degree, that they were become seminaries of wickedness and villany, and the most formidable nuisances to the community; in consequence of the promiscuous intercourse of prisoners of both sexes, and of all ages and descriptions; whereby the young and less experienced were initiated, by old and hardened sinners, into all the arts of villany and the mysteries of iniquity; so that, instead of being reformed by their confinement (which should be the chief end of punishment), those that were discharged became more injurious to society than before.

In order to the attainment of these great objects, Mr Howard spared no pains nor expence, and cheerfully exposed himself to much inconvenience and hazard; particularly from that malignant distemper, of which he saw many dying in the most loathsome dungeons, into which none, who were not obliged, besides himself, would venture. "I have been frequently (says Mr Howard) asked what precautions I used to preserve myself from infection in the prisons and hospitals which I visited. I here answer, next to the free goodness and mercy of the Author of my being, temperance and cleanliness are my preservatives. Trusting in divine providence, and believing myself in the way of my duty, I visit the most noxious cells; and while thus employed, I fear no evil. I never enter an hospital or prison before breakfast; and in an offensive room, I seldom draw my breath deeply."

His laudable endeavours he had the pleasure to see, in some instances, crowned with success; particularly in regard to the healthiness of prisons, some of which were rebuilt under his inspection. Through his interposition also, better provision has been made for the instruction of prisoners, by the introduction of bibles and other pious books into their cells, and a more constant attendance of clergymen. The gaolers likewise have, by act of parliament, been rendered incapable of selling strong liquors, which had been the source of much drunkenness and disorder. But a minute detail of particulars is not to be expected here; for these the reader is referred to Mr Howard's publications, which show that much is yet wanting.

But in order to a more general and happy regulation, and the reformation of criminals, he determined to visit other countries, to see the plans there adopted; in hope of collecting some information which might be useful in his own country. For this purpose he travelled into France, Flanders, Holland, Germany, and Switzerland. Afterwards through the Prussian and Austrian dominions. He visited also the capitals of Denmark, Sweden, Russia, and Poland, and some cities in Portugal and Spain. In all these expensive and hazardous journeys, he denied himself the usual gratifications of travellers, and declined the honours which were offered him by persons of the first distinction, applying himself solely to his one grand object. To him the inspection of a jail, or hospital, was more grateful than all the entertainments of a palace. With what astonishment and gratitude he was received by their miserable inhabitants may easily be imagined, since while he made observations on their situation, he meditated their relief; and many distressed prisoners abroad, as well as at home, partook of his bounty, and some were liberated by it; for he considered all of every nation,

Howard.

tion, and people, and tongue, as brethren. Nor was he ſparing of advice, or of reproof, as he ſaw occaſion, to perſons of rank and influence, whereby the miſeries of their countrymen might be relieved. As he courted the favour of none, neither did he fear the frowns of any; but with a manly freedom and a Chriſtian fortitude, ſpoke his mind to crowned heads (particularly the late emperor of Germany) in a manner to which they were not accuſtomed; which, however, in a perſon of ſuch diſintereſted views, procured him reverence and eſteem, and in ſome inſtances proved effectual for relieving the miſerable and oppreſſed. On his return, he publiſhed in 1777, "The State of the Priſons in England and Wales, with Preliminary Obſervations, and an Account of ſome foreign Priſons." 4to. And in 1778 he took a third journey through the Pruſſian and Auſtrian dominions, and the free cities of Germany, and likewiſe extended his tour through Italy, and reviſited ſome of the countries he had before ſeen. The obſervations he made in this tour were publiſhed in an appendix, 1780; containing alſo ſome remarks reſpecting the management of priſoners of war, and the hulks on the Thames. But wiſhing to acquire ſome further knowledge on the ſubject, he in 1781 again reviſited Holland and ſome cities in Germany. He viſited alſo the capitals of Denmark, Sweden, Ruſſia, and Poland; and in 1783 ſome cities in Portugal and Spain, and returned through France, Flanders, and Holland. The ſubſtance of all theſe travels was afterwards thrown into one narrative, which was publiſhed in 1784. He alſo publiſhed a curious account of the Baſtile, in 8vo.; that infamous French priſon, happily now no more.

His travels and exertions, however, were not yet at an end. He conceived a further deſign, which was to viſit the principal lazarettoes in France and Italy, in order to obtain information concerning the beſt methods to prevent the ſpreading of the plague, with a view to apply them with reſpect to other infectious diſorders. Not gaining all the ſatisfaction here which he wiſhed for, he proceeded to Smyrna and Conſtantinople, where that moſt dreadful of human diſtempers actually prevailed, "pleaſing himſelf (as he ſaid) with the idea of not only learning, but of being able to communicate ſomewhat to the inhabitants of thoſe diſtant regions." In the execution of this deſign, though he was ſo much expoſed to danger, and actually caught the plague, "that merciful Providence (as he himſelf piouſly remarks) which had hitherto preſerved him, was pleaſed to extend his protection to him in this journey alſo, and to bring him home once more in ſafety." In his return he reviſited the chief priſons and hoſpitals in the countries through which he paſſed; and afterwards went again to Scotland, and then to Ireland, where he propoſed a new and very important object; namely, to inſpect the Proteſtant Charter Schools, in ſome of which he had before obſerved ſhameful abuſes, which he had reported to a committee of the Iriſh Houſe of Commons. In this more extenſive tour, he took a particular account of what he obſerved amiſs in the conduct of this noble charity, with a view to a reformation, and not without conſiderable ſucceſs. In the courſe of theſe journeys, particular cities and communities were not unmindful to pay him proper reſpect. At Dublin, he was created by the univerſity a Doctor of Laws; and the city of Glaſgow and the town of Liverpool did honour to themſelves by enrolling him among their members. Upon his return home, having again inſpected the priſons in England, and the hulks on the Thames, to ſee what alterations had been made for the better (which he found to be very conſiderable, though yet imperfect), he publiſhed the reſult of his laſt laborious inveſtigations, in "An Account of the Principal Lazarettoes in Europe, with various Papers relative to the Plague, together with further Obſervations on ſome Foreign Priſons and Hoſpitals, and additional Remarks on the preſent State of thoſe in Great Britain and Ireland," with a great number of curious plates. The work likewiſe contained Obſervations on Penitentiary Houſes, which had been encouraged by act of parliament, for the correction and reformation of criminals, of which he and Dr Fothergill had been nominated by the king to be ſuperintendants. Beſide theſe, he publiſhed the Grand Duke of Tuſcany's "new Code of Criminal Law, with an Engliſh Tranſlation:" and of all his publications he gave away a vaſt number of copies among his acquaintance in the moſt liberal manner. His laying open the horrors of deſpotiſm in a neighbouring country had very nearly expoſed him to the ſufferings of them; and had it not been for the timely notice of our ambaſſador, he had ended his days in the Baſtile.

Not ſatisfied, however, with what he had already done, he concludes his "Account of Lazarettoes" with announcing his "intention again to quit his country, for the purpoſe of reviſiting Ruſſia, Turkey, and ſome other countries, and extending his tour in the eaſt. I am not inſenſible (ſays he) of the dangers that muſt attend ſuch a journey. Truſting, however, in the protection of that kind Providence which has hitherto preſerved me, I calmly and cheerfully commit myſelf to the diſpoſal of unerring wiſdom. Should it pleaſe God to cut off my life in the proſecution of this deſign, let not my conduct be uncandidly imputed to raſhneſs or enthuſiaſm, but to a ſerious deliberate conviction that I am purſuing the path of duty, and to a ſincere deſire of being made an inſtrument of more extenſive uſefulneſs to my fellow-creatures than could be expected in the narrower circle of a retired life." Accordingly, to the great concern of his friends, he ſet out in ſummer 1789 on this hazardous enterpriſe; the principal object of which was to adminiſter a medicine in high repute at home, in malignant fevers *, under a ſtrong perſuaſion that it would be equally efficacious in the plague. In this ſecond tour in the eaſt "it *did* pleaſe God to cut off his life:" for, having ſpent ſome time at Cherſon, a new ſettlement of the empreſs of Ruſſia, on the mouth of the Dnieper or Boryſthenes, toward the northern extremity of the Black ſea, near Oczakow, he caught, in viſiting the Ruſſian hoſpital of that place, or as ſome ſay a young lady who was ill of the ſame complaint, a malignant fever, which carried him off on the 20th of January, after an illneſs of about twelve days: and after having been kept, according to his expreſs directions to his ſervant, five days, he was buried, by his own deſire, in the garden of a villa in the neighbourhood, belonging to a French gentleman from whom he had received

* Dr James's Powder.

received great civilities, by his faithful ſervant who had attended him on his former journeyings, and whom he expreſsly enjoined not to return home till five weeks from his death. While abſent on his firſt tour to Turkey, &c. his character for active benevolence had ſo much attracted the public attention, that a ſubſcription was ſet on foot to erect a ſtatue to his honour, and in no long ſpace above 1500l. was ſubſcribed for that purpoſe. But ſome of thoſe who knew Mr Howard beſt, never concurred in the ſcheme, being well aſſured that he would neither countenance nor accede to it; and in conſequence of two letters from Mr Howard himſelf * to the ſubſcribers, the deſign was laid aſide. It has, however, been reſumed ſince his death: And ſurely, of all the ſtatues or monuments ever erected by public gratitude to illuſtrious characters either in ancient or modern times, none was ever erected in honour of worth ſo genuine and admirable as his—who devoted his time, his ſtrength, his fortune, and finally ſacrificed his life, in the purſuits of humanity:—who (to adopt the expreſſive words of Mr Burke †) "viſited all Europe [and the eaſt], not to ſurvey the ſumptuouſneſs of palaces, or the ſtatelineſs of temples; not to make accurate meaſurements of the remains of ancient grandeur, nor to form a ſcale of the curioſity of modern art; not to collect medals, or to collate manuſcripts: but to dive into the depth of dungeons; to plunge into the infection of hoſpitals; to ſurvey the manſions of ſorrow and of pain; to take the gauge and dimenſions of miſery, depreſſion, and contempt; to remember the forgotten; to attend to the neglected; to viſit the forſaken; and to compare and collate the diſtreſſes of all men in all countries. His plan is original; and it is as full of genius as it is of humanity. It is a voyage of diſcovery, a circumnavigation of charity; and already the benefit of his labour is felt more or leſs in every country."

* See *Gent. Mag.* vol. lvii. p. 101.

† *Speech at Guildhall in Briſtol*, 1780.

HOWDEN, a town in the eaſt riding of Yorkſhire, 180 miles from London, ſtands on the north ſide of the Ouſe, has a market on Saturdays, and four fairs in the year. Here was formerly a collegiate church of five prebendaries; adjacent to which the biſhops of Durham, who poſſeſs many eſtates here with a temporal juriſdiction, have a palace. One of them built a very tall ſteeple to the church here, whither the inhabitants might retire in caſe of inundations; to which it is very liable from the great freſhes that come down the Ouſe ſometimes at ebb. This part of the county is from hence called Howdenſhire, and is watered by a conflux of ſeveral large rivers that fall into the Humber. At Howdendike is a ferry over the Ouſe.

HOWE, Richard, Earl, an Engliſh naval commander of diſtinguiſhed eminence, was born in the year 1725, being the ſecond ſon of Lord Viſcount Howe, by the daughter of Baron Kilmanſegg. From his early attachment to the life of a mariner, he quitted the ſchool of Eton at the age of 14, and went on board the Severn, the honourable Captain Legge being commander, deſtined for the South ſeas under Commodore Anſon. Mr Howe next appeared in the Burford, Captain Luſhington commander, who being killed in an expedition againſt the Caraccas, Commodore Knowles made Mr Howe an acting lieutenant. At the age of 20 he was promoted to the rank of commander in the Baltimore ſloop of war, and he joined a ſquadron at that time cruiſing off the coaſt of Scotland, where he met with an opportunity of diſplaying his undaunted courage and intrepidity, by engaging and beating off two French frigates of 30 guns each, by the aſſiſtance of another armed ſhip, notwithſtanding he was ſeverely wounded in the head during the action. This ſervice was immediately and very juſtly rewarded with the rank of poſt-captain. He was ſoon after appointed to the rank of captain on board Commodore Knowles's own ſhip of 80 guns, with which he returned to England in the year 1748. When hoſtilities again commenced, he commanded the Dunkirk of 60 guns, in North America; which ſhip conſtituted part of the ſquadron under Admiral Boſcawen, and with which he captured a French man of war of ſuperior metal off the coaſt of Newfoundland; viz. the Alcide of 64 guns. In order to annoy the coaſt of France, he received, in the year 1758, the command of a ſmall ſquadron, with which he effected the deſtruction, at St Malo, of a number of magazines and ſhips. When he ſerved on board the Eſſex, Prince Edward, afterwards duke of York, ſailed with him, at which time he powerfully contributed to the reduction of the town of Cherbourg. In 1758 his elder brother fell in North America in the ſervice of his king and country, on which event the young commodore ſucceeded to the family title and eſtate. In the following year he participated of the honourable victory gained by Sir Edward Hawke over the French fleet under Admiral Conflans. He afterwards ſerved in the Channel, and was captain of the Amelia, the ſhip of admiral the duke of York. On the reſtoration of peace, he was nominated one of the lords of the admiralty, and ſome time afterwards, treaſurer of the navy. He was in the year 1770, raiſed to the rank of rear-admiral of the blue, and choſen commander-in-chief on the Mediterranean ſtation. In 1775, he roſe to the ſtation of rear-admiral of the blue; in conſequence of which rapid promotions, Lord Hawke paid him the following compliment in the houſe of peers: "I adviſed his majeſty to make the promotion. I have tried my Lord Howe on important occaſions; he never aſked me how he was to execute any ſervice, but always went and performed it."

In the ſummer of 1776, Lord Howe appeared off Maſſachuſets, as commander-in-chief of his Britannic majeſty's fleet acting in North America, and in the capacity of a commiſſioner for reſtoring the bleſſings of an amicable reconciliation. All the provincial governors were made acquainted with his arrival by means of circular letters, expreſſive alſo of the full extent of the authority inveſted in him and his fellow commiſſioners; but as congreſs did not deem the conditions which theſe letters contained to be at all ſatisfactory, they were ordered to be inſerted in all the gazettees for the examination of the people. His powers being thus circumſcribed at the very commencement, he could only act in the capacity of a naval commander, in which he aided the operations of the land forces with uncommon ſkill. It was not to be imagined, however, that much glory could redound to his lordſhip from ſuch an unequal conteſt, till the junction of France with America placed the contending parties more upon a level. On the arrival of Admiral D'Eſtaign in the month of July 1778, off Sandy Hook, Lord Howe was certainly in a

Howe. very critical ſituation; but by an exertion of uncommon ſkill and dexterity, the French commander thought it prudent to retire, when he was purſued by Lord Howe to Rhode iſland, after he obtained a reinforcement under Admiral Byron. The intentions of the enemy were completely counteracted, and the campaign was finally terminated with honour. Here he reſigned his command, and came over to England; but in 1782 he was promoted to the rank of admiral of the bluc, made a viſcount of Great Britain, and choſen commander of the fleet which was ſent for the relief of Gibraltar. The combined fleets of France and Spain were about a third ſuperior to that under Lord Howe, who with 34 ſail of the line appeared off Gibraltar in the month of October, being driven into the Mediterranean by contrary winds. Although he was purſued by the combined fleet, he found means to ſupply the fortreſs with proviſions. He checked the enemy by a partial action, and notwithſtanding he offered to give them battle, it was declined on their part; and he had the ſatisfaction to execute his commiſſion prior to his return home, in ſpite of the numerous difficulties which he had to encounter.

He was nominated firſt lord of the admiralty on the termination of the war, which he both reſigned and reſumed by different changes of adminiſtration. In the year 1787 he was choſen admiral of the white, and created an earl of Great Britain in the following year. When hoſtilities were renewed with France in 1793, his lordſhip accepted the command of the channel fleet, at the expreſs deſire of his Britannic majeſty, but he had it not in his power to do any thing deciſive till the ſummer of 1794. On the ever memorable 1ſt of June, with a fleet conſiſting of 25 ſail of the line, he gave battle to a French fleet of 26, gaining a moſt ſignal victory over the enemy, capturing ſeven of their ſhips, one of which was ſo ſhattered as to go to the bottom, and ſeveral others were, in the language of ſeamen, very much crippled. His lordſhip had the good fortune not to loſe a ſhip, and comparatively but a few men, conſidering the prodigious loſs in this reſpect ſuſtained by the enemy. The gratitude of the nation was ſuitable to the importance of this naval victory, and it is more than probable that the firſt of June will never be forgotten. In 1795 he was made general of marines; but the infirmities which ſeldom fail to be the concomitants of old age, induced him to reſign his naval command in the year 1797, and on his final retreat he was preſented with the honours of the garter. His great influence as a beloved officer, contributed greatly to ſtifle a ſpirit of mutiny and diſcontent which at this time exhibited alarming ſymptoms among the ſeamen of his majeſty's fleets. He terminated his brilliant and honourable career on the 5th of Auguſt 1799, in the 73d year of his age, leaving none but female iſſue behind him. His lordſhip's valour, always cool and ſteady, was conſequently of that nature which enables a commander to make the moſt of his ſituation; his judgment was ſound and penetrating, which prevented him from being eaſily impoſed upon by external appearances; and his ſeamanſhip was of the moſt conſummate and maſterly kind. It is with pleaſure we cloſe this conciſe account of his lordſhip's public life by obſerving, that his country was deeply ſenſible of the value and importance of his ſervices, a truth fully evinced by the honours and preferments which it heaped upon him. Howe.

Howe-Iſland, a ſmall iſland of the South ſea, diſcovered by Captain Wallis, called by the inhabitants of the Society iſlands *Mopeha;* lies in S. Lat. 16. 46. and W. Long. 154. 8.

Lord Howe's Iſland, a ſmall iſland in the neighbourhood of New South Wales, diſcovered on February 17th, 1788. S. Lat. 31. 36. E. Long. 159. 04. It is of an arched figure, lying from north-weſt to ſouth-caſt, the two extremities including a ſpace of about ſix miles, though, by reaſon of the curved figure of the iſland itſelf, it is near ſeven in length. It is deeply indented in the middle of the eaſtern part by a bay named Roſs's bay, and on the oppoſite and weſtern part has another named Prince William Henry's bay; ſo that the whole has the appearance of two iſlands joined together by an iſthmus, which in ſome places is not above half a mile broad. On the ſouthern part of that diviſion which lies moſt to the northward are two conſiderable bays, named Callam's and Hunter's bay; and on the ſouth-weſtern part of the other are two high mountains, the moſt ſoutherly named Mount Gower, and the other Mount Lidgbird. The convex part of the iſland lying towards the northeaſt, and the concave ſide towards the oppoſite quarter, is terminated by two points named Point King and Point Philip. No freſh water was found on the iſland; but it abounds with cabbage-palms, mangrove, and manchineel trees, even up to the ſummits of the mountains. There are plenty of gannets, and a land fowl of a duſky brown colour, with a bill about four inches long, and feet like thoſe of a chicken. Theſe were found to be remarkably fine meat, and were very fat. There are many large pigeons, and the white birds found in Norfolk iſland were alſo met with in this place. The bill of this bird is red, and very ſtrong, thick, and ſharp pointed. Great numbers of fine turtle frequent this iſland in ſummer, but go to the northward in winter. Theſe, it was imagined, would prove of great ſervice to the colony at Port Jackſon; but, from ſome cauſe or other, it appears they have hitherto been diſappointed. Plenty of fiſh were caught by a hook and line. At the diſtance of about four leagues from Lord Howe's iſland is a very remarkable and high rock, to which the name of Ball's Pyramid has been given. This iſland may be approached without danger; but about four miles from the ſouth-weſt part of the pyramid there is a very dangerous rock, which ſhows itſelf above the ſurface of the water, and appears not to be larger than a boat. The ſouthern part of the iſland is lined with a ſandy beach, which is guarded againſt the ſea by a reef of coral rock, at the diſtance of half a mile from the beach, through which there are ſeveral ſmall openings for boats; but there is nowhere a greater depth of water within the reef than four feet. By the account of Mr Watts, who viſited this iſland in his return from Port Jackſon, the iſthmus which joins the two parts has evidently been overflowed, and the iſland disjoined, as in the very centre the men ſaw large beds of coral rocks and great quantities of ſhells; and on the eaſt, which ſeems in general to be the weather-ſide, the ſea has thrown up a bank of ſand from 25 to 30 feet high, which ſerves as a barrier againſt future inundations. The iſland alſo appears

pears to have suffered by volcanic eruptions, as great quantities of pumice-ſtones and other matters of that kind were found upon it. Mr Auſtin alſo found the whole reef which ſhelters the weſt bay a burnt-up maſs. The time he viſited the iſland was that of the incubation of the gannets, of which there were then prodigious numbers, their neſts being only hollows made in the ſand, there not being any quadrupeds on the iſland to diſturb them. Beſides the large pigeons already mentioned, they met with beautiful parrots and parroquets; a new ſpecies of the coote, as well as of the rail and magpie. They found likewiſe a very beautiful ſmall bird of a brown colour with a yellow breaſt, and yellow on the wing, which ſeemed to be a ſpecies of humming bird. They found alſo a black bird like a ſheerwater, having a hooked bill; and which burrows in the ground. The only inſects met with here were the common earth worm and ants: which laſt were in great plenty. Beſides the trees already mentioned, they found ſeveral eſculent vegetables, as ſcurvy-graſs, celery, ſpinach, endive, and ſamphire.

HOWITZ, a kind of mortar, mounted upon a field-carriage like a gun. The difference between a mortar and a howitz is, that the trunnions of the firſt are at the end, and at the middle in the laſt. The invention of howitzes is of much later date than mortars, for they really had their origin from them. The conſtructions of howitzes are as various and uncertain as thoſe of mortars, excepting the chambers, which are all cylindric. They are diſtinguiſhed by the diameter of the bore; for inſtance, a ten inch howitz is that the diameter of which is 10 inches; and ſo of the ſmaller ones.

HOWTH, a promontory which forms the northern entrance of the bay of Dublin, having a ſmall village about ſeven miles north-eaſt from that city in the province of Leinſter. It gives title of earl to the family of St Lawrence, who were ſo called from a victory obtained by them over the Iriſh on St Lawrence's day 1177, their former name being Triſtram; and this place has continued in poſſeſſion of the family above 600 years. N. Lat. 53. 21. W. Long. 6. 22. The ſhores off this hill are rocky and precipitous, affording, however, a few harbours for ſmall craft. It was formerly called Ben-hedar, i. e. "the Birds promontory;" and celebrated for having Dun Criomthan, or the rath or royal palace of Criomthan erected on it, he having been chief or king of that diſtrict, and memorable for making ſeveral ſucceſsful deſcents on the coaſt of Britain againſt the Romans in the time of Agricola. Howth, though now ſtript of trees, was formerly covered with venerable oaks, and was a ſeat of the Druids; one of their altars ſtill remains in a ſequeſtered valley on the eaſt ſide of the hill. The manſion-houſe is built in form of a caſtle, and was probably erected by Sir Armoricus Triſtram. Near the houſe ſtands the family chapel, and on the weſtern ſhore are the ruins of St Mary's church, with ſome ancient monuments of Lord Howth's anceſtors. Due weſt of Howth houſe are the ruins of St Fenton's church.

HOY, a ſmall veſſel, chiefly uſed in coaſting, or carrying goods to or from a ſhip, in a road or bay, where the ordinary lighters cannot be managed with ſafety or convenience.

It would be very difficult to deſcribe preciſely the marks of diſtinction between this veſſel and ſome others of the ſame ſize, which are alſo rigged in the ſame manner; becauſe what is called a *hoy* in one place, would aſſume the name of a *ſloop* or *ſmack* in another; and even the people who navigate theſe veſſels, have, upon examination, very vague ideas of the marks by which they are diſtinguiſhed from thoſe above mentioned. In Holland, the hoy has two maſts; in England, it has but one, where the main-ſail is ſometimes extended by a boom, and ſometimes without it. Upon the whole, it may be defined a ſmall veſſel, uſually rigged as a ſloop, and employed for carrying paſſengers and luggage from one place to another, particularly on the ſea-coaſt.

HOY, one of the Orkney iſlands, which lie off the north coaſt of Scotland, is ſituated between the iſland of Pomona and the north coaſt of Caithneſs, and is ſeparated from the ſmall iſland of Græmſay by a ſound of a mile broad. The whole iſland is nearly occupied by three large hills, of which that to the north-eaſt riſes from a broad baſe to the height of 1200 feet. Some veins of lead and iron have been diſcovered in this iſland. Birch trees of conſiderable ſize ſeem to have been produced on it in former times. But at preſent its vegetable productions, excepting what are fit for ſheep paſture, are extremely limited. A few hardy alpine plants and ſtunted ſhrubs include the whole. The number of inhabitants does not exceed 520. The Dwarfie ſtone is the only monument of antiquity in the iſland. This is a large maſs of ſandſtone 32 feet long, 18 broad, and 7½ feet thick above the ſurface. It is hollowed within, and divided into three apartments, one of which, called the *dwarf's bed*, is five feet eight long, by two feet broad. It has probably been the retreat of a hermit. Tradition ſays, that it was the habitation of a giant. Waas or Waes, which is often conſidered as a diſtinct iſland, makes part of Hoy. It is diſtinguiſhed for the excellence of its harbours, particularly the Longhope, one of the fineſt and ſafeſt in Europe. Waas contains 750 inhabitants.

HOYE, a town of Germany, in Weſtphalia, and capital of a county of the ſame name. It is ſeated on the river Weſer, and is ſubject to the elector of Hanover. E. Long. 9. 0. N. Lat. 53. 5.

HUAHEINE, one of the *Society Iſlands*, in the South ſea, ſituated in S. Lat. 16. 43. W. Long. 150. 52. and is about ſeven or eight leagues in compaſs. Its ſurface is hilly and uneven, and it has a ſafe and convenient harbour. It was firſt diſcovered by Captain Cook in 1769. It is divided by a deep inlet into two peninſulas connected by an iſthmus, which is entirely overflowed at high water. From the appearance of its hills it may be concluded, that the country has at ſome period or other been the ſeat of a volcano. The ſummit of one of them had much the appearance of a crater, and a blackiſh ſpongy earth was ſeen upon one of its ſides, which ſeemed to be lava; and the rocks and clay every where had a burnt appearance. The iſland is plentifully ſupplied with water by many rivulets which deſcend from the mountains and broken rocks. The inhabitants are nearly as fair as Europeans; and their conduct is bolder than that of the inhabitants of the other Society iſlands. They are a ſtout large-made people, ſome of the talleſt being ſix feet three inches in height; they are extremely indolent, aud ſeem to have

have as little curiosity as fear. The dogs are in great favou with all their women, "who could not have careſſed them (ſays Mr Forſter) with a more ridiculous affection if they had been European ladies of faſhion." Here was ſeen a middle-aged woman, whoſe breaſts were full of milk, offering them to a little puppy who had been trained up to ſuck them. The ſight diſguſted thoſe who ſaw it ſo much, that they could not forbear expreſſing their diſlike to it; but the woman ſmiled, and told them that ſhe allowed young pigs to do the ſame. It appeared afterwards that this woman had loſt her child. Some of the gentlemen were preſent at a dramatic entertainment on this iſland: the piece repreſented a girl running away from her parents; and ſeemed to be levelled at a female paſſenger who had come in Captain Cook's ſhip from Otaheite, and who happened to be preſent at the repreſentation. It made ſuch an impreſſion on the girl, that the gentlemen could ſcarce prevail upon her to ſee the piece out, or to refrain from tears while it was acting. It concluded with the reception ſhe was ſuppoſed to meet with from her friends, which was made out not to be a very agreeable one.—Theſe people introduce extempore pieces upon occaſion; and it is moſt probable that this was meant as a ſatire upon the girl above mentioned, and to diſcourage others from acting in the ſame manner.

HUBERT, St, a town of the Netherlands, on the confines of Liege, with a very fine abbey, where they bring thoſe that are bit by mad animals to be cured. E. Long. 5. 25. N. Lat. 34. 32.

HUBNER, John, a learned geographer of Germany, taught geography at Leipſic and Hamburg with extraordinary reputation; and died at Hamburg in 1732, aged 63. His principal work is A Geographical Treatiſe, printed at Baſil in 1746, in 6 vols 12mo.

HUDSON, Jeffrey. See Dwarf.

Hudson, *Henry*. Of this eminent naval diſcoverer we know nothing prior to the year 1607, when he was employed by ſome London merchants in a ſmall veſſel, for exploring a north-eaſt paſſage to China and Japan. He ſet ſail on the 1ſt of May with only ten men and a boy, and reached as high as 80° of N. Lat. where being ſtopt by the ice, he returned to England in the month of September following. In his next voyage he landed at Nova Zembla, but could make no farther eaſt, and he returned in Auguſt next year. The Dutch Eaſt India Company fitted him out in 1609, with a crew of 20 men, Engliſh and Dutch, and after in vain attempting to penetrate eaſtward, he ſteered for the American coaſt, and went as far as Cheſapeak bay. His crew mutinying, he durſt not attempt a weſterly paſſage through Davis's ſtrait, and therefore returned home.

His knowledge in conſequence of theſe voyages increaſed his ardour for diſcovery, and he again made an offer of his ſervices to the Dutch Eaſt India Company, which were not accepted; and for his laſt voyage, Sir Thomas Smith, Sir Dudley Digges, and ſome of his friends fitted him out. On the 17th of April he ſet ſail, and came in ſight of Greenland on the 4th of June. Sailing weſtward, he reached the mouth of the ſtrait which bears his name, through which he advanced along the coaſt of Labrador, which he called *Nova Britannia*. Here he hoped he had diſcovered the longwiſhed-for paſſage; but he found he was only in a bay, in the ſouthern part of which he determined to winter. After this he fitted out his ſhallop for farther diſcoveries, but as he had no means of revictualling his ſhip, he diſtributed his laſt remaining bread with tears in his eyes, among his people, and returned home. His mutinous crew entered his cabin by night, tied his hands behind his back, and ſet him aſhore at the weſt end of the ſtraits, with eight of the crew who were moſt attached to him. They were never more heard of, and it is probable they were ſwallowed up by the waves. Such was the unfortunate end of this adventurous mariner!

Hudson, *William*, a celebrated Engliſh botaniſt, was born at Weſtmoreland about 1730. He was bound apprentice to an apothecary in London, whoſe buſineſs he took, and proved a friend to the widow and daughters. It appears from the teſtimony of Dr Pulteney, that he had a reſidence in the Britiſh muſeum, but we are not informed in what capacity. He was alſo F. R. S. and died of a paralytic diſtemper in May 1793. He poſſeſſed a comprehenſive knowledge of Engliſh plants, which induced him to undertake an arrangement of Engliſh botany according to the Linnæan claſſification, a taſk which had been previouſly attempted by Dr Hill, but the execution was very imperfect. Hudſon's *Flora Anglica* appeared in 1762, in one volume 8vo, the Latin preface to which was written by the ingenious Mr Stillingfleet, and received with great applauſe, and contributed greatly to the adoption in England of the ſexual ſyſtem.

The merits of Mr Hudſon are thus deſcribed by Dr J. E. Smith. "His memory requires no ſtudied eulogium here, as every page of the preſent work is an index to his labours. May the writer of this leave no more errors behind him as an author, or as a man." Mr Hudſon well underſtood the inſects and ſhells of Great Britain, and always meditated a *Fauna Britannica*. His temper is ſaid to have been gentle, rather cloſe, but kind to thoſe who gained his eſteem.

Hudson's Bay, a large bay of North America, lying between 51 and 69 degrees of latitude, diſcovered in 1610 by Henry Hudſon. This intrepid mariner, in ſearching after a north-weſt paſſage to the South ſeas, diſcovered three ſtraits, through which he hoped to find out a new way to Aſia by America. He had made two voyages before on the ſame adventure; the firſt in 1607, and the ſecond in 1608. In his third and laſt, 1610, he entered the ſtraits that lead into this new Mediterranean, the bay known by his name; coaſted a great part of it; and penetrated to eighty degrees and a half into the heart of the frozen zone. His ardour for the diſcovery not being abated by the difficulties he ſtruggled with in this empire of winter, and world of froſt and ſnow, he ſtaid here until the enſuing ſpring, and prepared in the beginning of 1611 to purſue his diſcoveries; but his crew, who ſuffered equal hardſhips, without the ſame ſpirit to ſupport them, mutinied, ſeized upon him and ſeven of thoſe who were moſt faithful to him, and committed them to the fury of the icy ſeas in an open boat. Hudſon and his companions were either ſwallowed up by the waves, or gaining the inhoſpitable coaſt were deſtroyed by the ſavages; but the ſhip and the reſt of the men returned home. Other attempts towards a diſcovery were

Hudſon's Bay.

were made in 1612 and 1667; and a patent for planting the country, with a charter for a company, was obtained in the year 1670. In 1746 Captain Ellis wintered as far north as 57 degrees and a half, and Captain Chriſtopher attempted farther diſcoveries in 1761. But beſides theſe and the late voyages, which ſatisfy us that we muſt not look for a paſſage on this ſide of the latitude 67 degrees north, we are indebted to the Hudſon's Bay company for a journey by land; which throws much additional light on this matter, by affording what may be called demonſtration, how much farther north, at leaſt in ſome parts of their voyage, ſhips muſt go, before they can paſs from one ſide of America to the other. The northern Indians, who come down to the company's factories to trade, had brought to the knowledge of our people a river, which on account of much copper being found near it, had obtained the name of the Copper-mine river. The company being deſirous of examining into this matter with preciſion, directed Mr Hearne, a young gentleman in their ſervice, and who having been brought up for the navy and ſerved in it the war before laſt, was extremely well qualified for the purpoſe, to proceed over land under the convoy of thoſe Indians, for that river, which he had orders to ſurvey if poſſible quite down to its exit into the ſea; to make obſervations for fixing the latitudes and longitudes; and to bring home maps and drawings both of it and the countries through which he ſhould paſs. Accordingly Mr Hearne ſet out from Prince of Wales's Fort, on Churchill river, latitude 58° 47½′ north, and longitude 94° 7½′ weſt from Greenwich, on the 7th of December 1770. On the 13th of June he reached the Copper-mine river, and found it all the way, even to its exit into the ſea, encumbered with ſhoals and falls, and emptying itſelf into it over a dry flat of the ſhore, the tide being then out, which ſeemed by the edges of the ice to riſe about 12 or 14 feet. This riſe, on account of the falls, will carry it but a very ſmall way within the river's mouth, ſo that the water in it had not the leaſt brackiſh taſte. Mr Hearne was nevertheleſs ſure of the place it emptied itſelf into being the ſea, or a branch of it, by the quantity of whalebone and ſeal ſkins which the Eſquimaux had at their tents, and alſo by the number of ſeals which he ſaw upon the ice. The ſea at the river's mouth was full of iſlands and ſhoals as far as he could ſee by the aſſiſtance of a pocket teleſcope; and the ice was not yet (July 17th) broken up, but thawed away only for about three quarters of a mile from the ſhore, and for a little way round the iſlands and ſhoals which lay off the river's mouth. But he had the moſt extenſive view of the ſea when he was about eight miles up the river; from which ſtation the extreme parts of it bore north-weſt by weſt and north-eaſt. By the time Mr Hearne had finiſhed his ſurvey of the river, which was about one o'clock in the morning on the 18th, there came on a very thick fog and drizzling rain; and as he had found the river and ſea in every reſpect unlikely to be of any utility, he thought it unneceſſary to wait for fair weather to determine the latitude more exactly by obſervation; but by the extraordinary care he took in obſerving the courſes and diſtances, walking from Congecathawhachaga, where he had two very good obſervations, he thinks the latitude may be depended on within 20′ at the utmoſt. It appears from the map which Mr Hearne conſtructed of this ſingular journey, that the mouth of the Copper-mine river lies in latitude 72° north and longitude 25° weſt from Churchill river; that is, about 119° weſt of Greenwich. Mr Hearne's journey back from the Copper-mine river to Churchill laſted till June 30th 1772; ſo that he was abſent almoſt a year and ſeven months. The unparalleled hardſhips he ſuffered, and the eſſential ſervice he performed, met with a ſuitable reward from his maſters, and he was made governor of Prince of Wales's Fort on Churchill river. But though the adventurers failed in the original purpoſe for which they navigated this bay, their project, even in its failure, has been of great advantage to this country, as is ſhown under the article COMPANY (*Hudſon's Bay*).

Hudſon's Bay.

The country lying round Hudſon's bay is called *New Britain*, or the country of the Eſquimaux; comprehending *Labrador*, now North and South Wales. The entrance of the bay from the ocean, after leaving to the north Cape Farewell and Davis's ſtraits, is between Reſolution iſles on the north, and Button's iſles on the Labrador coaſt to the ſouth, forming the eaſtern extremity of the ſtraits diſtinguiſhed by the name of its great diſcoverer. The coaſts are very high, rocky, and rugged at top; in ſome places precipitous, but ſometimes exhibit large beaches. The iſles of Saliſbury, Nottingham, and Digges, are alſo very lofty and naked. The depth of water in the middle of the bay is a hundred and forty fathoms. From Cape Churchill to the ſouth end of the bay are regular ſoundings; near the ſhore ſhallow, with muddy or ſandy bottom. To the north of Churchill the ſoundings are irregular, the bottom rocky, and in ſome parts the rocks appear above the ſurface at low water. From Mooſe river or the bottom of the bay to Cape Churchill the land is flat, marſhy, and wooded with pines, birch, larch, and willows. From Cape Churchill to Wager's Water the coaſts are all high and rocky to the very ſea, and woodleſs, except the mouths of Pockerekeſko and Seal rivers. The hills on their back are naked, nor are there any trees for a great diſtance inland.

The mouths of all the rivers are filled with ſhoals; except that of Churchill, in which the largeſt ſhips may lie; but ten miles higher, the channel is obſtructed with ſand banks; and all theſe rivers, as far as has been navigated, are full of rapids and cataracts from ten to ſixty feet perpendicular. Down theſe rivers the Indian traders find a quick paſſage; but their return is a labour of many months. As far inland as the company have ſettlements, which is ſix hundred miles to the weſt, at a place called Hudſon Houſe, lat. 53. long. 106. 27. from London, is a flat country: nor is it known how far to the eaſtward the great chain ſeen by our navigators from the Pacific ocean branches off.

The climate even about Haye's river, in only lat. 57. is during winter exceſſively cold. The ſnows begin to fall in October, and continue falling by intervals the whole winter; and when the froſt is moſt rigorous, in form of the fineſt ſand. The ice on the rivers is eight feet thick. Port-wine freezes into a ſolid maſs; brandy coagulates. The very breath fell on the blankets of the beds in the form of a hoar froſt, and the bed-clothes often were found frozen to the wall.

The

The ſun riſes in the ſhorteſt day at five minutes paſt nine, and ſets five minutes before three. In the longeſt day the ſun riſes at three, and ſets about nine. The ice begins to diſappear in May, and hot weather commences about the middle of June, which at times is ſo violent as to ſcorch the face of the hunters. Thunder is not frequent, but very violent. But there muſt be great difference of heat and cold in this vaſt extent, which reaches from lat. 50. 40. to lat. 63. north.—During winter the firmament is not without its beauties. Mock ſuns and halos are not unfrequent; they are very bright, and richly tinged with all the colours of the rainbow. The ſun riſes and ſets with a large cone of yellowiſh light. The night is enlivened with the Aurora Borealis, which ſpreads a thouſand different lights and colours over the whole concave of the ſky, not to be defaced even by the ſplendour of the full moon; and the ſtars are of a fiery redneſs.

The eaſtern boundary of the bay is Terra di Labrador; the northern part has a ſtraight coaſt facing the bay, guarded with a line of iſles innumerable. A vaſt bay, called the Archiwinnipy ſea, lies within it, and opens into Hudſon's bay by means of Gulf Hazard, through which the beluga whales dart in great numbers. Here the company had a ſettlement for the ſake of the fiſhery, and for trading with the Eſquimaux; but deſerted it as unprofitable about the year 1758 or 1759. The eaſtern coaſt is barren paſt the efforts of cultivation. The ſurface is everywhere uneven, and covered with maſſes of ſtone of an amazing ſize. It is a country of fruitleſs valleys and frightful mountains, ſome of an aſtoniſhing height: the firſt watered by a chain of lakes, formed not from ſprings but rain and ſnow, ſo chilly as to be productive of only a few ſmall trout. The mountains have here and there a blighted ſhrub, or a little moſs. The valleys are full of crooked ſtunted trees, pines, fir, birch, and cedars, or rather a ſpecies of juniper. In lat. 60. on this coaſt, vegetation ceaſes. The whole ſhore, like that on the weſt, is faced with iſlands at ſome diſtance from land. The inhabitants among the mountains are Indians; along the coaſts Eſquimaux. The dogs of the former are very ſmall; of the latter large, and headed like a fox. Notwithſtanding they have rein-deer, they never train them for the ſledge; but apply the dogs to that uſe. Walruſes viſit a place called Nuchvûnk, in lat. 60. during winter; from thence the natives purchaſe the teeth with which they head their darts. Davis ſuſpected that he had found a paſſage on this coaſt in 1586, to the Weſtern ocean; but it proves no more than a deep bay.

The laudable zeal of the Moravian clergy induced them to ſend, in the year 1752, miſſionaries from Greenland to his country. They fixed on Niſbet's harbour for their ſettlement; but the firſt part was partly killed, partly driven away. In 1764, under the protection of our government, another attempt was made. The miſſionaries were well received by the Eſquimaux, and the miſſion goes on with ſucceſs.

The animals of theſe countries are, the mooſe deer, ſtags, rein-deer, bears, buffaloes, wolves, foxes, beavers, otters, lynxes, martins, ſquirrels, ermines, wild cats, and hares. The rein-deer paſs in vaſt herds towards the north in October, ſeeking the extreme cold. The male polar bears rove out at ſea, on the floating ice, moſt of the winter, and till June: the females lie concealed in the woods, or beneath the banks of rivers till March, when they come abroad with their twin cubs, and bend their courſe to the ſea in ſearch of their conſorts. Several are killed in their paſſage: and thoſe which are wounded ſhow vaſt fury, roar hideouſly, and bite and throw up into the air even their own progeny. The females and the young, when not interrupted, continue their way to ſea. In June the males return to ſhore, and by Auguſt are joined by their conſorts, with the cubs, by that time of a conſiderable ſize. The feathered kind are, geeſe, buſtards, ducks, partridges, and all manner of wildfowls. Indeed multitudes of birds retire to this remote country, to Labrador and Newfoundland, from places moſt remotely ſouth, perhaps from the Antilles; and ſome even of the moſt delicate little ſpecies. Moſt of them, with numbers of aquatic fowls, are ſeen returning ſouthward with their young broods to more favourable climates. The ſavages, in ſome reſpects, regulate their months by the appearance of birds; and have their gooſe month from the vernal appearance of geeſe from the ſouth. All the grous kind, ravens, cinereous crows, titmouſe, and Lapland finch, brave the ſevereſt winter; and ſeveral of the falcons and owls ſeek ſhelter in the woods. Of fiſh, there are whales, morſes, ſeals, cod-fiſh, and a white fiſh preferable to herrings; and in their rivers and freſh waters, pike, perch, carp, and trout.

All the quadrupeds of theſe countries are clothed with a cloſe, ſoft, warm fur. In ſummer there is here, as in other places, a variety in the colours of the ſeveral animals; when that ſeaſon is over, which holds only for three months, they all aſſume the livery of winter, and every ſort of beaſts, and moſt of their fowls, are of the colour of the ſnow; every thing animate and inanimate is white. This is a ſurpriſing phenomenon. But what is yet more ſurpriſing, and what is indeed one of the moſt ſtriking things, that draw the moſt inattentive to an admiration of the wiſdom and goodneſs of Providence, is, that the dogs and cats from Britain that have been carried into Hudſon's bay, on the approach of winter have entirely changed their appearance, and acquired a much longer, ſofter, and thicker coat of hair than they had originally.

Hudson's-Bay Company. See Company.

Hudson's-River, a large river of North America which riſes on the eaſt of Lake Ontario, and running by Albany, and on the back of the ſouth part of New-England through part of New-York, falls into the bay of the ſea beyond the weſt end of Long-Iſland, and below the town of New-York.

HUDSONIA, a genus of plants belonging to the dodecandria claſs. See Botany *Index*.

HUE *and* Cry, in *Law*, the purſuit of a perſon who has committed felony on the highway.—Of this cuſtom, which is of Britiſh origin, the following deduction is given by Mr Whitaker. "When it was requiſite for the Britons to call out their warriors into the field, they uſed a method that was particularly marked by its expeditiouſneſs and deciſiveneſs, and remains partially among us to this moment. They raiſed a cry, which was immediately caught by others, and in an inſtant tranſmitted from mouth to mouth through all the region. And, as the notice paſſed along

along, the warriors ſnatched their arms, and hurried away to the rendezvous. We have a remarkable deſcription of the fact in Cæſar, and there ſee the alarm propagated in 16 or 17 hours through 160 miles in a line. And the ſame practice has been retained by the Highlanders to our own time. When the lord of a clan received intelligence of an enemy's approach, he immediately killed a goat with his own ſword, dipped the end of a half-burnt ſtick in the blood, and then gave it and the notice of the rendezvous to be carried to the next hamlet. The former ſymbolically threatened fire and ſword to all his followers that did not inſtantly repair to the latter. The notice was deſpatched from hamlet to hamlet with the utmoſt expedition; and in three or four hours the whole clan was in arms, and aſſembled at the place appointed. This was within theſe few years the ordinary mode by which the chieftains aſſembled their followers for war. The firſt perſon that received the notice, ſet out with it at full ſpeed, delivered it to the next that he met, who inſtantly ſet out on the ſame ſpeed, and handed it to a third. And in the rebellion of 1745, it was ſent by an unknown hand through the region of Breadalbane; and flying as expeditiouſly as the Gallic ſignal in Cæſar, traverſed a tract of 32 miles in three hours. This quick method of giving a diffuſive alarm is even preſerved among ourſelves to the preſent day; but is applied, as it ſeems from Cæſar's account above to have been equally applied among the Celtæ, to the better purpoſes of civil polity. The *hutesium and clamour* of our laws, and the *hue and cry* of our own times, is a well-known and powerful proceſs for ſpreading the notice and continuing the purſuit of any fugitive felons. The cry, like the clamour of the Gauls or the ſummons of the Highlanders, is taken from town to town and from county to county; and a chain of communication is ſpeedily carried from one end of the kingdom to the other."

HUER, a name given to certain fountains in Iceland, of a moſt extraordinary nature; forming at times *jets d'eaux* of ſcalding water ninety-four feet high and thirty in diameter, creating the moſt magnificent gerbes that can be imagined, eſpecially when backed by the ſetting ſun. They ariſe out of cylindrical tubes of unknown depths: near the ſurface they expand into apertures of a funnel ſhape, and the mouths ſpread into large extent of ſtalactitical matter, formed of ſucceſſive ſcaly concentric undulations. The playing of theſe ſtupendous ſpouts is foretold by noiſes roaring like the cataract of Niagara. The cylinder begins to fill: it riſes gradually to the ſurface, and gradually increaſes its height, ſmoking amazingly, and flinging up great ſtones. After attaining its greateſt height, it gradually ſinks till it totally diſappears. Boiling *jets d'eaux* and boiling ſprings are frequent in moſt parts of the iſland. In many parts they are applied to the culinary uſes of the natives. The moſt capital is that which is called *Geyer*, or *Geyſer*, in a plain riſing into ſmall hills, and in the midſt of an amphitheatre, bounded by the moſt magnificent and various ſhaped icy mountains; among which the three-headed Hecla ſoars pre-eminent. See ICELAND, N° 4. —Theſe huers are not confined to the land; they riſe in the very ſea, and form ſcalding fountains amidſt the waves. Their diſtance from the land is unknown; but the new volcanic iſle, twelve miles off the point of Reickenes, emitting fire and ſmoke, proves that the ſubterraneous fires and waters extend to that ſpace; for thoſe awful effects ariſe from the united fury of theſe two elements.

HUESCA, an ancient and conſiderable town of Spain, in the kingdom of Arragon, with a biſhop's ſee and a univerſity. It is ſeated on the Iſſuela, in a ſoil producing excellent wine, in W. Long. 0. 2. N. Lat. 42. 18.

HUESCAR, or GUESCAR, a town of Spain, in the kingdom of Granada, ſeated on a plain, in W. Long. 2. 20. N. Lat. 37. 32.

HUESNE, or HUENA, a ſmall iſland in the Baltic ſea, in the Sound, where was the famous obſervatory of Tycho Brahé. E. Long. 12. 38. N. Lat. 55. 54.

HUET, PETER DANIEL, a very learned French writer, born at Caen in Normandy, on the 8th of February 1630. He diſcovered, from his infancy, a great inclination to the ſtudy of polite literature and the ſciences, and at firſt applied himſelf to the law; but Des Cartes's principles, and Bochart's ſacred geography, made him change his ſtudies for thoſe of philoſophy, mathematics, the languages, and antiquities. His admiration for Bochart made him deſirous of knowing him. He contracted a very ſtrict friendſhip with him, and accompanied that learned man to Sweden. Here Chriſtina would have engaged him in her ſervice; but he, ſenſible of her inconſtant temper, returned to France. All he brought with him was a copy of a MS. of Origen, which he tranſcribed at Stockholm. He refuſed ſeveral offers from Chriſtina after ſhe abdicated and went to Rome, and from Guſtavus her ſucceſſor. In 1670, Mr Boſſuet being appointed by the king preceptor to the dauphin, his majeſty choſe Mr Huet for his colleague, with the title of *ſub-preceptor to the prince*. It was he that formed the plan of the commentaries *in uſum Delphini*, and directed the execution. His ſentiments of piety determined him to enter into holy orders, which he did at the age of 46. Soon after this, he was preſented by the king to the abbey of Aunay; and in 1685 was nominated to the biſhopric of Soiſſons, which he changed for the ſee of Avranches. After governing that dioceſe ten years, he reſigned, and was made abbot of Fontenay near Caen. His love to his native place determined him to fix there. But lawſuits coming upon him, he retired to Paris, and lodged among the Jeſuits in the *Maiſon Profeſſe*, whom he had made heirs to his library. A ſevere diſtemper weakened his body extremely, but not the vivacity of his genius: he wrote his own life in a very elegant ſtyle; and died in 1721, aged 91. He was a man of very agreeable converſation; and of great probity, as well as immenſe erudition.—The following are the titles of his principal works. 1. *De claris interpretibus, et de optimo genere interpretandi.* 2. An edition of Origen's Commentaries on the Holy Scriptures, in Greek and Latin. 3. A Treatiſe on the Origin of the Romans. 4. *Demonſtratio evangelica*, folio. 4. *Quæſtiones Alnetanæ de concordia rationis et fidei.* 6. Of the Situation of the terreſtrial Paradiſe, in French. 7. A Hiſtory of the Commerce and Navigation of the Ancients, which has been tranſlated into Engliſh. 8. *Commentarius de rebus ad eum pertinentibus.* 9. *Huetiana.* 10. Latin and Greek verſes, &c.

HUGHLY, or Hoogly, a town of Asia, in the kingdom of Bengal, feated on the moft wefterly branch of the river Ganges. It is now nearly in ruins, but was in the beginning of the 18th century a place of large extent, reaching about two miles along the riverfide, and had a great trade in all the commodities of that country; affording rich cargoes for 50 or 60 fhips annually, befides what was brought in carriages to the neighbouring towns. Saltpetre was brought hither from Patna in veffels above 50 yards long and five broad. The inhabitants are chiefly Indians; but there are alfo Portuguefe, Englifh, and other Europeans. E. Long. 88. 28. N. Lat. 32. 30.

HUGO Capet, chief of the third race of the kings of France, being count of Paris and Orleans: he was raifed to the throne for his military valour and public virtues in 987. See France, N° 38.

HUGONIA, a genus of plants belonging to the monadelphia clafs; and in the natural method ranking with thofe of which the order is doubtful. See Botany *Index*.

HUGUENOTS, an appellation given by way of contempt to the reformed or Proteftant Calvinifts of France.

The name had its firft rife in 1560; but authors are not agreed as to the origin and occafion thereof: but one of the two following feems to be the leaft forced derivation.

One of the gates of the city of Tours is called the gate Fourgon, by corruption from *feu Hugon*, i. e. the late Hugon. This Hugon was once count of Tours according to Eginhardus in his life of Charles the Great, and to fome other hiftorians. He was it feems a very wicked man, who by his fierce and cruel temper made himfelf dreadful; fo that after his death he was fuppofed to walk about in the night-time, beating all thofe he met with: this tradition the judicious Thuanus has not fcrupled to mention in his hiftory. Davila and other hiftorians pretend, that the nickname of *Huguenots* was firft given to the French Proteftants, becaufe they ufed to meet in the night-time in fubterraneous vaults near this gate of Hugon; and what feems to countenance this opinion is, that they were firft called by the name of *Huguenots* at this city of Tours.

Others affign a more illuftrious origin to that name; and fay that the leaguers gave it to the reformed, becaufe they were for keeping the crown upon the head of the line defcended from Hugh Capet; whereas they were for giving it to the houfe of Guife, as defcended from Charles the Great.

Others again derive it from a French and faulty pronunciation of the German word *edignoffen*, fignifying confederates, and originally applied to that valiant part of the city of Geneva, which entered into an alliance with the Swifs cantons, in order to maintain their liberties againft the tyrannical attempts of Charles III. duke of Savoy.

Thefe confederates were called *Eignots*, whence Huguenots.

The perfecution which they underwent has fcarce its parallel in the hiftory of religion: though they obtained a peace from Henry III. in 1576, it was only of fhort continuance; and their fufferings, mitigated by the famous edict of Nantes, granted to them in 1598 by Henry IV. were again renewed, after the revocation of that edict, by Louis XIV. in 1685.

HULK, an old fhip of war, fitted with an apparatus to fix or take out the mafts of his majefty's fhips, as occafion requires.

The maft of this veffel is extremely high, and withal properly ftrengthened by *fhrouds and ftays*, in order to fecure what are called the *fheers*, which ferve, as the arm of a crane, to hoift out or in the mafts of any fhip lying alongfide. The fheers are compofed of feveral long mafts, whofe heels reft upon the fide of the hulk, and having their heads declining outward from the perpendicular, fo as to hang over the veffel whofe mafts are to be fixed or difplaced. The tackles, which extend from the head of the maft to the fheer-heads, are intended to pull in the latter towards the mafthead, particularly when they are charged with the weight of a maft after it is raifed out of any fhip, which is performed by ftrong tackles depending from the fheer-heads. The effort of thefe tackles is produced by two capfterns, fixed on the deck for this purpofe.

Hulk, is alfo a name beftowed on any old veffel laid by as unfit for further fervice. It is probably derived from the ὁλκαδες, or veffels of burthen, of the ancient Grecians.

HULL, in the fea-language, is the main body of a fhip, without either mafts, yards, fails, or rigging. Thus *to ftrike a hull* in a ftorm, is to take in her fails, and to lafh the helm on the lee-fide of the fhip; and *to hull*, or *lie a-hull*, is faid of a fhip whofe fails are thus taken in, and helm lafhed a-lee.

Hull, a river in Yorkfhire, which falls into the Humber at *Kingston upon Hull*. See Kingston.

HUMAN, in general, is an appellation given to whatever relates to mankind: thus we fay, the human foul, human body, human laws, &c.

HUMANITY, the peculiar nature of man, whereby he is diftinguifhed from all other beings.

Humanities, in the plural, fignify grammar, rhetoric, and poetry, known by the name of *literæ humaniores;* for teaching of which, there are profeffors in the univerfities of Scotland, called *humanifts*.

HUMBER, a river formed by the Trent, Oufe, Derwent, and feveral other ftreams. By means of inland navigation, it has a communication with the rivers Merfey, Dee, Ribble, Severn, Thames, Avon, &c. which navigation, including its windings, extends above 500 miles, in the counties of Lincoln, Nottingham, York, Lancafter, Weftmoreland, Chefter, Stafford, Warwick, Leicefter, Oxford, Worcefter. It divides Yorkfhire from Lincolnfhire, and falls into the German ocean near Holdernefs.

HUME, David, Efq. a celebrated philofopher and hiftorian, was born in the fouth part of Scotland on the 26th of April O. S. in the year 1711. Being the younger fon of a country gentleman of good family, but no great fortune, his patrimony was of confequence infufficient to fupport him. For this reafon he was deftined for the bar, and paffed through his academical courfes in the univerfity of Edinburgh; but being more inclined to ftudies of a different nature, he never put on the gown, nor even took the introductory fteps for that purpofe. The writings of Locke and Berkeley had directed the attention of the generality of learned men towards

wards metaphyſics; and Mr Hume having early applied himſelf to ſtudies of this kind, publiſhed in 1739 the two firſt volumes of his Treatiſe of Human Nature, and the third the following year. He had the mortification, however, to find his book generally decried; and to perceive, that the taſte for ſyſtematic writing was now on the decline. He therefore divided this treatiſe into ſeparate Eſſays and Diſſertations, which he afterwards publiſhed at different times with alterations and improvements.

In 1742, Mr Hume publiſhed two ſmall volumes, conſiſting of Eſſays moral, political, and literary. Theſe were better received than his former publication; but contributed little to his reputation as an author, and ſtill leſs to his profit; and his ſmall patrimony being now almoſt ſpent, he accepted an invitation from the marquis of Annandale to come and live with him in England. With this nobleman he ſtaid a twelvemonth; during which time his ſmall fortune was conſiderably increaſed. He then received an invitation from General St Clair, to attend him as a ſecretary to his expedition, which was at firſt meant againſt Canada, but afterwards ended in an excurſion againſt the coaſt of France. In 1747, he received an invitation from the general to attend him in the ſame ſtation in his military embaſſy to the courts of Vienna and Turin. He then wore the uniform of an officer; and was introduced at theſe courts as aid-de-camp to the general, along with Sir Harry Erſkine and Captain Grant, afterwards General Grant. In 1749, he returned to Scotland, and lived two years with his brother at his country-houſe; where he compoſed the ſecond part of his eſſays, called *Political Diſcourſes*. And now the general approbation of his performances was indicated by a more extenſive ſale than formerly, and likewiſe by the numerous anſwers publiſhed by different perſons in order to counteract their ſuppoſed pernicious tendency. In 1752, were publiſhed at Edinburgh his Political Diſcourſes, the only work of his which was well received on its firſt appearance; and the ſame year at London, his Inquiry concerning the Principles of Morals, which in his own opinion was incomparably the beſt of all his performances. This year alſo he was appointed librarian to the faculty of advocates at Edinburgh; the principal advantage reſulting from which employment was, that he had by that means the command of a large library. He then formed the plan of writing the Hiſtory of England: but deeming the whole to be too extenſive, he confined his hiſtory to that of Britain under the houſe of Stuart. The book was almoſt univerſally decried on its firſt appearance, and ſoon after ſeemed to ſink in oblivion. Dr Herring, primate of England, and Dr Stone, primate of Ireland, were the only literati of the author's acquaintance who approved of the work, and ſent him meſſages not to be diſcouraged.

Notwithſtanding the approbation of theſe eminent men, however, Mr Hume's ſpirits were ſo much ſunk by his bad ſucceſs, that he had ſome thoughts of retiring to France, changing his name, and bidding adieu to his own country for ever; but his deſign was rendered impracticable by the breaking out of the war of 1755 between France and Britain. He then publiſhed his Natural Hiſtory of Religion; to which an anſwer was publiſhed, ſoon after its appearance, in the name of Dr Hurd biſhop of Litchfield and Coventry; of which, however, he ſince diſclaimed being the ſole author. In 1756, the ſecond volume of the Hiſtory of the Stuarts was publiſhed, two years after the appearance of the firſt. This was better received, and helped to retrieve the character of the former volume. Three years after, his Hiſtory of the Houſe of Tudor made its appearance; which was almoſt as ill received as the Hiſtory of the Stuarts had been, the reign of Elizabeth being particularly obnoxious. The author, however, had now learned to deſpiſe popular clamours; and continued to finiſh at his leiſure the more early part of the Engliſh hiſtory, which was publiſhed in 1761, and was received with tolerable ſucceſs.

Mr Hume being now turned of fifty, and having obtained by the ſale of his books a competent and independent fortune, retired into his native country of Scotland, determined never more to ſet his foot out of it. From this reſolution, however, he was diverted by the earl of Hertford; whom he attended as ſecretary on his embaſſy to Paris in 1763. In 1765, the earl being appointed lord-lieutenant of Ireland, Mr Hume was intruſted with the ſole management of the buſineſs of the ſtate till the arrival of the duke of Richmond towards the latter end of the year. In 1767, he returned to Edinburgh, with a much larger income, procured to him by the earl of Hertford, than he formerly had; and now formed the ſame deſign he had formerly entertained, namely, of burying himſelf in his philoſophical retreat. In this, however, he was again diſappointed, by receiving an invitation from General Conway to be under ſecretary; and this invitation he was prevented from declining, both by the character of the perſon, and his connexions with Lord Hertford. In 1769 he returned to Edinburgh, poſſeſſed of 1000l. a-year, healthy, and though ſomewhat ſtricken in years, yet having a proſpect of long enjoying his eaſe, and of ſeeing the increaſe of his reputation. Of his laſt illneſs and character, he himſelf gives the following account. In ſpring 1775, I was ſtruck with a diſorder in my bowels; which at firſt gave me no alarm, but has ſince, as I apprehend it, become mortal and incurable. I now reckon upon a ſpeedy diſſolution. I have ſuffered very little pain from my diſorder; and what is more ſtrange, have, notwithſtanding the great decline of my perſon, never ſuffered a moment's abatement of my ſpirits; inſomuch, that were I to name the period of my life which I ſhould moſt chooſe to paſs over again, I might be tempted to point to this latter period. I poſſeſs the ſame ardour as ever in ſtudy, and the ſame gaiety in company. I conſider, beſides, that a man of ſixty-five, by dying, cuts off only a few years of infirmities; and though I ſee many ſymptoms of my literary reputation breaking out at laſt with additional luſtre, I know that I could have but few years to enjoy it. It is difficult to be more detached from life than I am at preſent.

"To conclude, hiſtorically, with my own character, I am, or rather was (for that is the ſtyle I muſt now uſe in ſpeaking of myſelf, which emboldens me the more to ſpeak my ſentiments)—I was, I ſay, a man of mild diſpoſitions, of command of temper, of an open, ſocial, and cheerful humour, capable of attachment, but little ſuſceptible of enmity, and of great moderation in all my paſſions. Even my love of literary fame, my ruling paſſion, never ſoured my temper, notwithſtanding my frequent diſappointments. My company was not unacceptable to the young and careleſs, as well as to the ſtudious and literary; and as I took particular pleaſure in the company of modeſt women, I had no reaſon to be diſpleaſed with the reception I met with from them. In a word, though moſt men anywiſe eminent have found reaſon to complain of calumny, I never was touched, or even attacked, by her baleful tooth: and though I wantonly expoſed myſelf to the rage of both civil and religious factions, they ſeemed to be diſarmed in my behalf of their wonted fury. My friends never had occaſion to vindicate any one circumſtance of my character and conduct: not but that the zealots, we may well ſuppoſe, would have been glad to invent and propagate any ſtory to my diſadvantage, but they could never find any which they thought would wear the face of probability. I cannot ſay there is no vanity in making this funeral oration of myſelf, but I hope it is not a miſplaced one; and this is a matter of fact which is eaſily cleared and aſcertained."

His fears concerning the incurableneſs of his diſorder proved too true. He died on the 25th of Auguſt 1776; and was interred in the Calton burying-ground, Edinburgh, where a monument is erected to his memory.

HUMECTATION, formed of humour, moiſture, moiſtening, in pharmacy, the preparing of a medicine, by ſteeping it a while in water, in order to ſoften and moiſten it when too dry; or to cleanſe it, or prevent its ſubtile parts from being diſſipated in grinding, or the like.

Humectation is alſo uſed for the application of moiſtening remedies.

In this ſenſe we ſay, embrocations, emplaſters, unctions, humectations, fomentations, &c.

HUMERUS, or *Os Humeri*, in *Anatomy*, the uppermoſt bone of the arm, popularly called the *ſhoulder-bone;* extending from the ſcapula, or ſhoulder-blade, to the upper end of the cubitus, or elbow. See Anatomy *Index*.

HUMIDITY, that quality in bodies whereby they are capable of wetting other bodies. This differs very much from fluidity; and ſeems to be merely a relative thing, depending on the congruity of the component particles of the liquor to the pores of ſuch particular bodies as it is capable of adhering to, penetrating a little into, or wetting. Thus, for inſtance, quickſilver is not a moiſt thing with regard to our hands or clothes; but may be called ſo in reference to gold, tin, or lead, to whoſe ſurfaces it will perfectly adhere, and render them ſoft and moiſt.

HUMILIATI, a congregation of religious in the church of Rome, eſtabliſhed by ſome Milaneſe gentlemen on their releaſe from priſon, where they had been confined under the emperor Conrad, or, as others ſay, under Frederick I. in the year 1162. This order, which acquired great wealth, and had no leſs than 90 monaſteries, was aboliſhed by Pope Pius V. in 1570, and their houſes given to the Dominicans and Cordeliers, for their luxury and cruelty.

HUMILIATION, the act of humbling, i. e. of abating a perſon's pride, and bringing him lower in his opinion.

In this ſenſe humiliation ſtands diſtinguiſhed from mortification: humiliation brings down the mind; mortification ſubdues the fleſh.

HUMILITY, in *Ethics*, is a virtue conſiſting in the moderate value which a perſon puts upon himſelf, and every thing relating to him. Or, more particularly, it conſiſts in not attributing to ourſelves any excellence or good which we have not; in not overrating any thing which we have or do; in not taking an immoderate delight in one's ſelf; in not aſſuming more of the praiſe of a quality or action than belongs to us; and in a lowly ſenſe and acknowledgment of our imperfections, errors, and ſins. This virtue expreſſes itſelf in the modeſty of our appearance, of our purſuits, and of our behaviour towards other men. It is diſtinguiſhed from affectation, baſhfulneſs, and meanneſs.

HUMMING-bird. See Trochilus, Ornithology *Index*.

HUMOUR, from the Latin *humor*, in its original ſignification, ſtands for moiſture in general; from whence it has been reſtrained to ſignify the moiſture of animal bodies, or thoſe fluids which circulate through them.

It is diſtinguiſhed from moiſture in general in this, that humours properly expreſs the fluids of the body; when in a vitiated ſtate, it would not be improper to ſay, that the fluids of ſuch a perſon's body were full of humours.

The only fluids of the body, which, in their natural and healthful ſtate, are called *humours*, are thoſe in the eye; we talk of the aqueous humour, the cryſtalline humour, without meaning any thing that is morbid or diſeaſed: yet when we ſay in general, that ſuch a perſon has got a humour in his eye, we underſtand it in the uſual ſenſe of a vitiated fluid.

As the temper of the mind is ſuppoſed to depend upon the ſtate of the fluids in the body, humour has come to be ſynonymous with temper and diſpoſition. A perſon's humour, however, is different from his *diſpoſition*, in this, that humour ſeems to be the diſeaſe of a diſpoſition: it would be proper to ſay that perſons of a ſerious temper or diſpoſition of mind, were ſubject to melancholy humours; that thoſe of a delicate and tender diſpoſition, were ſubject to peeviſh humours.

Humour may be agreeable or diſagreeable: but it is ſtill humour; ſomething that is whimſical, capricious, and not to be depended upon. An ill-natured man may have fits of good-humour, which ſeem to come upon him accidentally, without any regard to the common moral cauſes of happineſs or miſery.

A fit of cheerfulneſs conſtitutes the whole of good-humour; and a man who has many ſuch fits, is a good-humoured man: yet he may not be good-natured; which is a character that ſuppoſes ſomething more conſtant, equable, and uniform, than what is requiſite to conſtitute good humour.

Humour is often made uſe of to expreſs the quality of the imagination, which bears a conſiderable reſemblance to wit.

Wit expreſſes ſomething that is more deſigned, concerted, regular, and artificial; humour, ſomething that is more wild, looſe, extravagant, and fantaſtical; ſomething which comes upon a man by fits, which he can neither command nor reſtrain, and which is not perfectly conſiſtent with true politeneſs. Humour, it has been

been ſaid, is often more diverting than wit; yet a man of wit is as much above a man of humour as a gentleman is above a buffoon; a buffoon, however, will often divert more than a gentleman. The duke of Buckingham, however, makes humour to be all in all; wit, according to him, ſhould never be uſed, but to add an agreeableneſs to ſome proper and juſt ſentiment, which, without ſome ſuch turn, might paſs without its effect. See WIT.

HUMPHREY, DR LAWRENCE, a very learned Engliſh divine in the 16th century, who, during the perſecution under Queen Mary, retired with other Proteſtant refugees to Zurich. He returned on the acceſſion of Queen Elizabeth; and was made preſident of Magdalene college, Oxford, dean of Glouceſter, and then dean of Wincheſter. He was a great and general ſcholar, an able linguiſt, and a deep divine; and publiſhed, 1. *De religionis conſervatione et reformatione, deque primatu regum.* 2. *De ratione interpretandi auctores.* 3. *Optimates; ſive de nobilitate, ejuſque origine.* 4. Sermons, and other works. He died in 1590.

HUMULUS, the HOP, a genus of plants belonging to the diœcia claſs; and in the natural method ranking under the 53d order, *Scabridæ*. For the culture and uſes of hops, ſee HOP.

HUNDRED, HUNDREDUM, or *Centuria*, a part or diviſion of a county; which was anciently ſo called from its containing an hundred families, or from its furniſhing an hundred able men for the king's wars. After King Alfred's dividing this kingdom into counties, and giving the government of each county to a ſheriff, theſe counties were divided into hundreds, of which the conſtable was the chief officer. The grants of hundreds were at firſt made by the king to particular perſons: but they are not now held by grant or preſcription, their juriſdiction being devolved to the county-court; a few of them only excepted, that have been by privilege annexed to the crown, or granted to ſome great ſubjects, and ſtill remain in the nature of a franchiſe.

Hundred-Court. This is only a larger *Court-Baron*, being held for all the inhabitants of a particular hundred inſtead of a manor. The free ſuitors are here alſo the judges, and the ſteward the regiſter, as in the caſe of a court-baron. It is likewiſe no court of record; reſembling the former in all points, except that in point of territory it is of a greater juriſdiction. This is ſaid by Sir Edward Coke to have been derived out of the county-court for the eaſe of the people, that they might have juſtice done them at their own doors, without any charge or loſs of time: but its conſtitution was probably coeval with that of hundreds themſelves, which were formerly obſerved to have been introduced though not invented by ALFRED, being derived from the policy of the ancient Germans. The *centeni*, we may remember, were the principal inhabitants of a diſtrict compoſed of different villages, originally in number an *hundred*, but afterwards only called by that name; and who probably gave the ſame denomination to the diſtrict out of which they were choſen. Cæſar ſpeaks poſitively of the judicial power exerciſed in *their* hundred-courts and courts-baron. "*Principes regionum, atque pagorum*," (which we may fairly conſtrue, the lords of hundreds and manors) "*inter ſuos jus dicunt, controverſiaſque minuunt.*" And Tacitus, who had examined their conſtitution ſtill more attentively, informs us not only of the authority of the lords, but that of the *centeni*, the hundreders, or jury; who were taken out of the common freeholders, and had themſelves a ſhare in the determination. "*Eliguntur in conciliis et principes, qui jura per pagos vicoſque reddunt: centeni ſingulis, ex plebe comites, conſilium ſimul et auctoritas, adſunt.*" This hundred-court was denominated *hæreda* in the Gothic conſtitution. But this court, as cauſes are equally liable to removal from hence as from the common court-baron, and by the ſame writs, and may alſo be reviewed by writ of falſe judgment, is therefore fallen into equal diſuſe with regard to the trial of actions.

HUNGARY, a kingdom of Europe, the greateſt part of which was anciently called *Pannonia*. It had the name of *Hungary* from the Hunns, a Scythian or Tartar nation, who ſubdued it in the ninth century. It lies between the 18th and 22d degrees of eaſt long. and betwixt the 45th and 49th degrees of north lat. being bounded to the north by the Carpathian mountains, which ſeparate it from Poland; to the ſouth by Servia, and the river Drave, which ſeparates it from Sclavonia; to the weſt by Moravia, Auſtria, and Stiria; and to the eaſt by Walachia and Tranſylvania. It is about 240 miles in length, and 235 in breadth; and is divided into the Upper and Lower Hungary, the former being that part which lies towards the eaſt, and the latter that which lies towards the weſt.

The northern parts of the kingdom are mountainous and barren, but healthy; the ſouthern, on the contrary, are level, and exceeding fruitful, but not very healthy. The country along the Danube, from Preſburg to Belgrade, for upwards of 200 miles, is one continued plain, and no ſoil can be more fertile; but the air, by reaſon of the many ſwamps and moraſſes, is not ſo wholeſome as on the higher and drier grounds. Here are mines of gold, ſilver, copper, iron, lead, quickſilver, cinnabar, antimony, yellow orpiment, ſulphur, vitriol, marcaſite, ſalt native and factitious, ſaltpetre, magnets, aſbeſtos or ſtone-flax, marble of ſeveral colours, alabaſter, with diamonds, and all ſorts of precious ſtones. Corn is in ſuch plenty, that it is ſold for one ſixth of its price in England. Their grapes are large and luſcious; and their wines preferred to any in Europe. They have vaſt numbers of cattle and horſes, the latter moſtly mouſe-coloured, with buffaloes, deer, wild fowl, game, and fiſh, and many ſpecies of wild beaſts, particularly chamois goats, bears, and lynxes. Of vegetables, beſides vines, and the common ſorts, here are tobacco, ſaffron, buck-wheat, millet, melons, and cheſnuts. Here alſo are excellent warm baths, and ſprings of various kinds and qualities. The chief mountains of Hungary are the Crapack or Carpathian, which is the general name for all thoſe that ſeparate this kingdom from Poland, Moravia, Sileſia, and ſome part of Auſtria. The ſides of moſt of them are covered with wood, and their tops with ſnow. The chief rivers are the Danube, the Drave, the Save, the Wag or Waag, the Gran, the Temes, the Raab, and Theiſs, all well ſtocked with fiſh. There are ſeveral lakes among the Carpathian mountains, and ſome alſo in the lowlands.

The inhabitants are a mixture of the defcendants of the ancient Huns, Sclavonians, Camani, Germans, Walachians, Greeks, Jews, Turks, and a wandering people called *Zigduns*, faid to be of uncertain origin, but probably the fame as thofe we called *gypfies*. The Hungarians are faid to be of a fanguine choleric temper, and fomewhat fierce, cruel, proud, and revengeful. They have been always reputed good foldiers, being much more inclined to arms, martial exercifes, and hunting, than to arts, learning, trade, or agriculture. The nobility affect great pomp and magnificence, and are much addicted to feafting and caroufing. The men in general are ftrong and well proportioned. They fhave their beards, but leave whifkers on the upper lip; wearing fur caps on their heads, a clofe-bodied coat girt with a fafh, with a fhort cloak or mantle over all, fo contrived as to be buckled under the arm, and leave the right hand at liberty. Their horfe are called *huffars*, and their foot *heydukes*. The former wear a broad-fword or fcimitar, and carry a hatchet or battle-axe. Their horfes are fleet, but not near fo large as the German horfes, and therefore they ftand up on their fhort ftirrups when they ftrike. The heydukes ufually wear feathers in their caps, according to the number of the enemies they pretend to have killed. Both horfe and foot are an excellent militia, very good at a purfuit, or ravaging and plundering a country, but not equal to regular troops in a pitched battle. The women, when they go abroad, wear fhort cloaks and a veil.

There are four languages fpoken in this country, viz. the Hungarian, which, like the people, is of Scythian origin, and has little or no affinity with any European tongue; the German, Sclavonian, Walachian, and Latin. The laft is fpoken, not only by the better fort, but alfo by the common people, though very corruptly. The people called *Zigduns* have alfo a particular jargon.—Chriftianity was planted in Hungary in the ninth and tenth centuries. In the fixteenth the reformation made a great progrefs in it; but at prefent, though the Roman Catholics hardly make a fourth part of the inhabitants, their religion is predominant, the Proteftants enjoying only a bare toleration. Befides feveral fects of Proteftants, here are alfo great numbers of the Greek church and Jews; the laft pay double taxes of all kinds. Befides Jefuits colleges and other convents, there are feveral univerfities for the Roman Catholics. The Lutherans alfo and Calvinifts have their gymnafiums and fchools, but under divers reftrictions.

As to the traffic of this country, it is almoft wholly in the hands of the Greeks and Jews. The exports confift chiefly of wine, horfes, cattle, metals, minerals, faffron, wool, and leather. Hungary, in particular, furnifhes Auftria, and other countries weft of it, with vaft droves of cattle, as well as a variety of excellent wines, of which thofe of Tockay are reckoned the beft. The principal manufactures are thofe of copper, brafs, iron, and other hard wares. Great quantities of brafs and iron are exported, wrought and unwrought.

Hungary at firft, like moft other countries, was divided into many little principalities and ftates, which at length were united under one head, who had the title of *duke*. The laft of thefe dukes was Geyfa; who, becoming a profelyte to Chriftianity, was baptized; after which he refigned the government to his fon Stephen, who took the title of *king*, *anno* 1000. But as the throne was filled by election, though generally out of the fame family, the difpofal of the crown was difputed between the Turkifh and German emperors for near 200 years: but after the year 1527, when Ferdinand archduke of Auftria was advanced to the throne, the Auftrians found means to influence the elections in fuch a manner, as to keep the crown in their family till 1687, when it was fettled hereditarily on their heirs male; and now, in confequence of an act made by the diet at Prefburg in 1723, in cafe of the failure of heirs-male, it is to defcend to females. The ftates of the kingdom confift of the prelates, the barons, the gentry, and the royal towns. To the firft clafs belong two archbifhops, about a dozen bifhops, near as many abbots and provofts, with the Pauline and Præmonftratenfian Jefuits. To the fecond, the ftadtholder or palatine, who reprefents the king; the court-judge; the ban or viceroy of Dalmatia, Croatia, and Sclavonia; the ftadtholder of Tranfylvania; the great treafurer, the great cup-bearer, the fteward of the houfehold, the mafter of the horfe, the lord chamberlain, the captain of the yeomen of the guards, and the grand marfhal of the courts, who are ftyled the great barons, together with the inferior bans or counts and barons. To the third clafs belong the gentry, fome of whom have noble manors, and others only the privileges of nobles. To the fourth clafs belong the royal free cities, which are not fubject to the counts, but hold immediately of the king. The gentry alfo, who hold of the archbifhops and bifhops, have the fame privileges as the Hungarian nobility. The common people are vaffals to the lords on whofe lands they live, whether thefe lands belong to the crown, the clergy, nobility or gentry.

The ordinary revenue of this kingdom is faid to exceed a million fterling, arifing from the mines, duties on cattle, royal demefnes, falt-works, contributions, cuftoms, &c. The fortifications and garrifons conftantly maintained on the frontiers againft the Turks, are a great expence to the government. Hungary can eafily bring into the field 100,000 men, regulars and militia; for there are 50,000 in actual pay, and the provinces furnifh the other 50,000 when they are wanted.

Hungary-Water, a diftilled water prepared from the tops of flowers of rofemary; fo denominated from a queen of Hungary, for whofe ufe it was firft made. See Pharmacy.

HUNGER, an uneafy fenfation occafioned by long abftinence from food when the body is in a healthy ftate.—See Abstinence; Fasting; and Anatomy, N° 103.

The following ufeful obfervations upon hunger or famine are extracted from a paper by Dr Percival in the fecond volume of the Manchefter Tranfactions.

In famine, life may be protracted (the doctor obferves) with lefs pain and mifery, by a moderate allowance of water. For the acrimony and putrefaction of the humours are obviated by fuch dilution, the fmall veffels are kept permeable, and the lungs are furnifhed with that moifture which is ef-

Plate CCLXII.

Hunger.

ſential to the performance of their functions. Fontanus, a writer of reſpectable authority in the eſtimation of Morgagni, relates the hiſtory of a woman who obſtinately refuſed to take any ſuſtenance, except twice, during the ſpace of 50 days, at the end of which period ſhe died. But he adds, that ſhe uſed water by way of drink, though in ſmall quantity. Redi, who made many experiments (cruel and unjuſtifiable in my opinion), to aſcertain the effects of faſting on fowls, obſerved, that none were able to ſupport life beyond the ninth day to whom drink was denied; whereas one indulged with water lived more than 20 days.

Hippocrates has obſerved, that children are more affected by abſtinence than young perſons; theſe, more than the middle-aged; and the middle-aged, more than old men. The power to endure famine, however, muſt depend no leſs upon the ſtate of health and ſtrength than on the age of the ſufferer. There are alſo particular conſtitutions which do not ſuffer much pain from the calls of hunger. Dr Percival was informed by a young phyſician from Geneva, that when he was a ſtudent at Montpelier, he faſted three nights and four days, with no other refreſhment than a pint of water daily. His hunger was keen, but never painful, during the firſt and ſecond days of his abſtinence; and the two following days, he perceived only a faintneſs when he attempted either bodily or mental exertion: A ſenſe of coldneſs was diffuſed over his whole frame, but more particularly affected the extremities. His mind was in a very unuſual ſtate of puſillanimity; and he experienced a great tendency to tears whenever he recollected the circumſtance which had been the occaſion of his faſting. During the whole period, the alvine excretions were ſuppreſſed, but not thoſe by the kidneys: and at the cloſe of it, his ſkin became tinged with a ſhade of yellow. The firſt food he took was veal broth; which had ſomething of an intoxicating effect, producing a glow of warmth, and raiſing his ſpirits, ſo as to render him aſhamed of his deſpondency. Perhaps in the caſe of Sextius Baculus, as recorded in the commentaries of Cæſar *, the extraordinary courage and proweſs which he ſuddenly exerted, might be aided by the exhilarating effect of ſuſtenance, which, under ſuch circumſtances, it is probable he would no longer decline. The fact, however, evinces, that neither his ſickneſs nor the ſenſations of hunger had been ſo violent as much to impair his ſtrength of body or vigour of mind. Pomponius Atticus, the celebrated friend of Cicero, who put a voluntary end to his life in the 77th year of his age by refuſing all food, appears to have experienced eaſe from his diſorder, rather than any acute ſufferings by famine. "Sic cum biduò cibo ſe abſtinuiſſet, ſubito febris deceſſit, leviorque morbus eſſe cœpit: tamen propoſitum nihilo ſecius perigit. Itaque die quinto, poſtquam id conſilium inierat, deceſſit." (*Corn. Nepos in Vit. Pomp. Attic.*) From the former circumſtance it has been conjectured, that he did not wholly deny himſelf the uſe of water, or of ſome other diluent. But though a few examples of this kind may be adduced, we have the evidence of numerous melancholy facts to ſhow, that the preſſure of want is agonizing to the human frame. "I have talked (ſays an ingenious writer ‡) with a captain of a ſhip, who was one of ſix that endured it in its extremity, and who was the only perſon that had not loſt his ſenſes when they received accidental relief. He aſſured me his pains at firſt were ſo great, as to be often tempted to eat a part of one of the men who died, and which the reſt of his crew actually for ſome time lived upon. He ſaid, that during the continuance of this paroxyſm, he found his pains inſupportable, and was deſirous at one time of anticipating that death which he thought inevitable: But his pains, he ſaid, gradually decreaſed after the ſixth day (for they had water in the ſhip, which kept them alive ſo long), and then he was in a ſtate rather of languor than deſire; nor did he much wiſh for food, except when he ſaw others eating; and that for a while revived his appetite, though with diminiſhed importunity. The latter part of the time, when his health was almoſt deſtroyed, a thouſand ſtrange images roſe upon his mind; and every one of his ſenſes began to bring him wrong information. The moſt fragrant perfumes appeared to him to have a fetid ſmell; and every thing he looked at took a greeniſh hue, and ſometimes a yellow. When he was preſented with food by the ſhip's company that took him and his men up, four of whom died ſhortly after, he could not help looking upon it with loathing inſtead of deſire; and it was not till after four days that his ſtomach was brought to its natural tone; when the violence of his appetite returned with a ſort of canine eagerneſs."

* Lib. 6.

‡ *Dr Goldſmith's Hiſt. of the Earth*, vol. ii. 126.

To thoſe who by their occupations are expoſed to ſuch dreadful calamities, it is of ſerious importance to be inſtructed in the means of alleviating them. The American Indians are ſaid to uſe a compoſition of the juice of tobacco, and the ſhells of ſnails, cockles, and oyſters calcined, whenever they undertake a long journey, and are likely to be deſtitute of proviſions. It is probable the ſhells are not burnt into quicklime, but only ſo as to deſtroy their tenacity, and to render them fit for levigation. The maſs is dried, and formed into pills, of a proper ſize to be held between the gum and lip, which, being gradually diſſolved and ſwallowed, obtund the ſenſations both of hunger and of thirſt. Tobacco, by its narcotic quality, ſeems well adapted to counteract the uneaſy impreſſions which the gaſtric juice makes on the nerves of the ſtomach when it is empty; and the combination of teſtaceous powder with it may tend to correct the ſecretion that is ſuppoſed to be the chief agent in digeſtion, and which, if not acid, is always united with acidity. Certain at leaſt it is, that their operation is both grateful and ſalutary; for we find the luxurious inhabitants of the Eaſt Indies mix them with the betel nut, to the chewing of which they are univerſally and immoderately addicted. Perhaps ſuch abſorbents may be uſefully applied, both to divide the doſes and to moderate the virulence of the tobacco. For, in the internal exhibition of this plant, much caution is required, as it produces ſickneſs, vertigo, cold clammy ſweats, and a train of other formidable ſymptoms, when taken in too large a quantity. During the time of war, the impreſſed ſailors frequently bring on theſe maladies, that they may be admitted into the hoſpitals, and releaſed from ſervitude. It would be an eaſy and ſafe experiment to aſcertain the efficacy, and to adjuſt the ingredients, of the Indian compoſition mentioned. And there is reaſon to believe, that the trial would be in ſome degree ſucceſsful; for it is known that ſmoking

tobacco

Hunger. tobacco gives relief to those habitual pains of the stomach which appear to arise from the irritation of the gastric secretions. The like effect is sometimes produced by increasing the flow of saliva, and swallowing what is thus discharged. And Dr Percival has related the case of a gentleman, who used to masticate, many hours daily, a piece of lead, which being neither hard, friable, nor offensive to the palate, suited his purpose, as he thought, better than any other substance. He continued the custom many years, deriving great ease from it, and suffering no sensible injury from the poisonous quality of the metal. On mentioning this fact to a navy surgeon, the doctor was told, that the sailors, when in hot climates, are wont to mitigate thirst by rolling a bullet in their mouths. A more innocent mean, the doctor observes, might be devised; but the efficacy of this evinces, that the salivary glands are for a while capable of furnishing a substitute for drink. When a scarcity of water occurs at sea, Dr Franklin has advised, that the mariners should bathe themselves in tubs of salt-water: For, in pursuing the amusement of swimming, he observed, that, however thirsty he was before immersion, he never continued so afterwards; and that, though he soaked himself several hours in the day, and several days successively in salt-water, he perceived not, in consequence of it, the least taste of saltness in his mouth. He also further suggests, that the same good effect might perhaps be derived from dipping the sailor's apparel in the sea; and expresses a confidence that no danger of catching cold would ensue.

To prevent the calamity of famine at sea, it has been proposed by Dr Lind, that the powder of salep should constitute part of the provisions of every ship's company. This powder and portable soup, dissolved in boiling water, form a rich thick jelly; and an ounce of each of these articles furnishes one day's subsistence to a healthy full grown man. Indeed, from Dr Percival's experiments it appears, that salep contains more nutritious matter, in proportion to its bulk, than any other vegetable production now used as food. It has the property also of concealing the nauseous taste of salt water; and consequently may be of great advantage at sea, when the stock of fresh water is so far consumed, that the mariners are put upon short allowance. By the same mucilaginous quality, it covers the offensiveness, and even in some measure, corrects the acrimony of salted and putrescent meats. But, as a preservative against hunger, salep would be most efficacious combined with an equal weight of beef suet. By swallowing little balls of this lubricating compound at proper intervals, the coats of the stomach would be defended from irritation: and as oils and mucilages are highly nutritive, of slow digestion, and indisposed to pass off by perspiration, they are peculiarly well adapted to support life in small quantities. This composition is superior in simplicity, and perhaps equal in efficacy, to the following one, so much extolled by Avicenna the celebrated Arabian physician; to whom we are indebted for the introduction of rhubarb, cassia, tamarinds, and senna, into the materia medica. "Take sweet almonds and beef-suet, of each one pound; of the oil of violets two ounces; and of the roots of marshmallows one ounce: bray these ingredients together in a mortar, and form the mass into boluses, about the size of a common nut." Animal fat is singularly powerful in assuaging the most acute sensations of thirst, as appears from the narrative of the sufferings experienced by those who were confined in the black hole at Calcutta. A hundred and forty-six persons, exhausted by fatigue and military duty, were there thrust together into a chamber of 18 cubic feet, having only two windows, strongly barred with iron, from which, in a close sultry night, and in such a climate as that of Bengal, little or no circulation of fresh air could be enjoyed. In a few minutes, these unhappy wretches fell into so profuse a perspiration, that an idea can hardly be formed of it; and this was succeeded by a raging thirst, which increased in proportion as the body was drained of its moisture. Water! Water! became the universal cry; and an old soldier on the outside, through pity, furnished them with a few skinfuls of it. But these scanty supplies, like sprinklings on the fire, served only to feed and increase the flame. From this experience of its effects, Mr Holwell, their chief, determined to drink no more; and kept his mouth moist by sucking the perspiration out of his shirt sleeves, and catching the drops as they fell from his head and face. "You cannot imagine (says he) how unhappy I was if any of them escaped me." He came into the prison without his coat, the season being too hot to bear it; and one of his miserable companions, observing the expedient he had hit upon of allaying his thirst, robbed him from time to time of a considerable part of his store. This plunderer, whom he found to be a young gentleman in the service of the East India Company, afterwards acknowledged, that he owed his life to the many comfortable draughts which he derived from him. Before Mr Holwell adopted this mode of relief, he had attempted, in an ungovernable fit of thirst, to drink his own urine: but it was so intensely bitter, that a second taste could not be endured, whereas, he assures us, no Bristol water could be more soft and pleasant than his perspiration. And this, we may presume, consisted chiefly of animal fat, melted by excessive heat, and exuding from the cellular membrane through the pores of the skin.

Persons who have been accustomed to animal food, are soon reduced when supplied only with the farinacea. Several years ago, to determine the comparative nutritive powers of different substances, an ingenious young physician, as Dr Percival informs us, made a variety of experiments on himself, to which he unfortunately fell a sacrifice. He lived a month upon bread and water; and under this regimen of diet he every day diminished much in his weight. But in 1784, a student of physic at Edinburgh confined himself for a longer space of time to a pint of milk and half a pound of white bread daily: And he assured our author, that he passed through the usual labours of study and exercise without feeling any decay of health or strength, and without any sensible loss of bulk. The cutaneous, urinary, and alvine excretions, were very scanty during the whole period; and the discharge of fæces occurred only once in a week. In this case the oily and coagulable parts of the milk probably furnished a larger proportion of aliment, and at the same time contributed to check the waste by perspiration and other discharges; for oleaginous substances are retained long in the body by their viscidity. Dr Russel,

Ruſſel, in his Natural Hiſtory of Aleppo, relates, that in thoſe ſeaſons when oil abounds, the inhabitants, by indulgence in it, are diſpoſed to fever, and affected with infarctions of the lungs; maladies which indicate both retention and obſtruction. Milk has been ſuſpected by ſome of producing ſimilar effects, though in a ſlighter degree; and the free uſe of it has been on this account forbidden to aſthmatics.

Gum arabic might be a good ſubſtitute for ſalep in the compoſition already recommended; and as it will give ſuch firmneſs to the maſs, as to require manducation, the ſaliva, by this means ſeparated and carried into the ſtomach, would further contribute to aſſuage the ſenſations both of hunger and of thirſt. See *Gum-Arabic*. This gum, combined with ſugar and the whites of eggs, has been lately extolled in France, under the name of *patigumo*, as a remedy for catarrhal defluxions. Dr Percival has ſeen cakes made of theſe ingredients, and thinks they might very well be applied to the purpoſe of obviating hunger. They are not periſhable in the hotteſt climates, may be carried about the perſon with convenience, and though very tough are pleaſant to the taſte. In the formula by which they are made, the proportion of ſugar is too large, and that of gum arabic too ſmall, if the maſs be intended to aſſuage the cravings of appetite. According to our author's information, the receipt is as follows. "Take of fine ſugar four ounces, and of gum arabic one ounce: Levigate them well together; and add half an ounce of roſe water, and of the white of eggs a ſufficient quantity."

In our attempts to recover thoſe who have ſuffered under the calamities of famine, great circumſpection is required. Warmth, cordials, and food, are the means to be employed; and it is evident that theſe may prove too powerful in their operation, if not adminiſtered with caution and judgment. For the body, by long faſting, is reduced to a ſtate of more than infantile debility; the minuter veſſels of the brain, and of the other organs, collapſe for want of fluids to diſtend them; the ſtomach and inteſtines ſhrink in their capacity; and the heart languidly vibrates, having ſcarcely ſufficient energy to propel the ſcanty current of blood. Under ſuch circumſtances, a proper application of heat ſeems an eſſential meaſure, and may be effected by placing on each ſide a healthy man in contact with the patient. Pediluvia or fomentations may alſo be uſed with advantage. The temperature of theſe ſhould be lower than that of the human body, and gradually increaſed according to the effects of their ſtimulus. New milk, weak broth, or water gruel, ought to be employed both for the one and the other; as nutriment may be conveyed into the ſyſtem this way, by paſſages probably the moſt pervious in a ſtate of faſting, if not too long protracted. "A lad at Newmarket *, a few years ago, having been almoſt ſtarved in order that he might be reduced to a proper weight for riding a match, was weighed at nine o'clock in the morning, and again at ten; and he was found to have gained near 30 ounces in weight in the courſe of an hour, though he had only drank half a glaſs of wine in the interval. The wine probably ſtimulated the action of the nervous ſyſtem, and incited nature, exhauſted by abſtinence, to open the abſorbent pores of the whole body, in order to ſuck in ſome nouriſhment from the air." But no ſuch abſorption as this can be expected in a ſtate of extreme weakneſs and emaciation gradually induced; becauſe the lymphatics muſt partake of the general want of tone and energy. And notwithſtanding the ſalutary effects of wine in the caſe of the jockey, who, it is likely, had been reduced by ſweating as well as by abſtinence, ſuch a ſtimulant might prove dangerous, and even fatal in other caſes. It appears ſafer therefore to adviſe the exhibition of cordials in very ſmall doſes, and at firſt conſiderably diluted. Slender wine-whey will perhaps beſt anſwer this purpoſe; and afford, at the ſame time, an eaſy and pleaſant nouriſhment. When the ſtomach has been a little ſtrengthened, an egg may be mixed with the whey, or adminiſtered under ſome other agreeable form. The yolk of one was, to Cornaro, ſufficient for a meal; and the narrative of this noble Venetian, in whom a fever was excited by the addition of only two ounces of food to his daily allowance, ſhows, that the return to a full diet ſhould be conducted with great caution, and by very ſlow gradations.

* *Watſon's Chemical Eſſays*, vol. iii. p. 101.

HUNGERFORD, a town of Berkſhire in England, ſeated on the river Kennet, in a low and watery ſoil. It is a great thoroughfare in the Bath and Briſtol road, ſixty-five miles from London; and was formerly called *Ingleford-Charnamſtreet*. The conſtable of this town, who is choſen annually, is lord of the manor, which he holds immediately of the crown. They have a horn here which holds about a quart, and appears by an inſcription on it to have been given by John of Gaunt, together with a grant of the royal fiſhery, in a part of the river which abounds with good trouts and craw-fiſh. Here is a market on Wedneſdays, and fair in Auguſt.

HUNNINGUEN, a town of Germany, in Alſace, and in Suntgaw, ſubject to the French; ſeated on the Rhine, and fortified by Vauban. E. Long. 11. 40. N. Lat. 47. 42.

HUNNS, a fierce and ſavage nation, who formerly inhabited that part of Sarmatia bordering on the Palus Mæotis and the Tanais, the ancient boundary between Europe and Aſia. Their country, as deſcribed by Procopius, lay north of Mount Caucaſus, which, extending from the Euxine to the Caſpian ſeas, parts Aſiatic Sarmatia from Colchis, Iberia, and Albania; lying on the iſthmus between the two ſeas above mentioned. Here they reſided unknown to other nations, and themſelves ignorant of other countries, till the year 376. At this time, a hind purſued by the hunters, or, according to ſome authors, an ox ſtung by a gad-fly, having paſſed the marſh, was followed by ſome Hunns to the other ſide, where they diſcovered a country much more agreeable than their own. On their return, having acquainted their countrymen with what they had ſeen, the whole nation paſſed the marſh, and falling upon the Alans, who dwelt on the banks of the Tanais, almoſt exterminated them. They next fell upon the Oſtrogoths, whom they drove out of their country, and forced to retire to the plains between the Boryſthenes and the Tanais, now known by the name of *Podolia*. Then attacking the Viſigoths, they obliged them to ſhelter themſelves in the moſt mountainous parts of their country; till at laſt the Gothic nations finding it impoſſible to withſtand ſuch an inundation of barbarians, obtained leave from the emperor Valens to ſettle in Thrace.

The Hunns thus became masters of all the country between the Tanais and Danube in 376, where they continued quietly till the year 388, when great numbers of them were taken into the pay of Theodosius I. but, in the mean time, a party of them, called the *Nephthalite* or *White Hunns*, who had continued in Asia, overran all Mesopotamia, and even laid siege to Edessa, where they were repulsed with great slaughter by the Romans. The European Hunns frequently passed the Danube, committing the greatest ravages in the western empire; sometimes they fell upon the eastern provinces, where they put all to fire and sword. They were often defeated and repulsed by the Romans, but the empire was now too weak to subdue or confine them from making excursions; so that they continued to make daily encroachments, and became every day more formidable than before. In 411, the Hunns, under Attila, threatened the western empire with total destruction. This monarch, having made himself master of all the northern countries from the confines of Persia to the banks of the Rhine, invaded Mæsia, Thrace, and Illyricum; where he made such progress, that the emperor not thinking himself safe in Constantinople, withdrew into Asia. Attila then broke into Gaul; where he took and destroyed several cities, massacring the inhabitants with the greatest cruelty. At last he was driven out with great slaughter by Aetius the Roman general, and Theodoric king of the Goths, and could never afterwards make any great progress. About the year 452 or 453 Attila died, and his kingdom was immediately split into a number of small ones by his numerous children, who waged perpetual war with each other. The Hunns then ceased to be formidable, and became daily less able to cope with the other barbarous nations whom Attila had kept in subjection. Still, however, their dominion was considerable; and in the time of Charles the Great they were masters of Transylvania, Walachia, Servia, Carniola, Carinthia, and the greater part of Austria, together with Bosnia, Sclavonia, and that part of Hungary which lies beyond the Danube. In the year 776, while Charles was in Saxony, two princes of the Hunns, Caganus and Jugunus, sent ambassadors to him, desiring his friendship and alliance. Charles received them with extraordinary marks of friendship, and readily complied with their request. However, they entered, not long after, into an alliance with Tassila duke of Bavaria, who had revolted from Charles, and raised great disturbances in Germany. Charles dissembled his resentment till he had entirely reduced Bavaria, when he resolved to revenge himself on the Hunns for those succours they had underhand given to his enemy. Accordingly, he ordered levies to be made throughout his dominions; and having by that means assembled a very numerous army, he divided it into two bodies, one of which he commanded himself, and the other he committed to the care of his generals. The two armies entered the country of the Hunns at different places, ravaged their country far and near, burnt their villages, and took all their strong holds. This he continued for eight years, till the people were almost totally extirpated; nor did the Hunns ever afterwards recover themselves, or appear as a distinct nation.

There were two different nations that went by the name of *Hunns*; the Nephthalite or White Hunns, and the Sarmatian or Scythian Hunns. The former inhabited a rich country, bordering to the north on Persia, and at a great distance from the Sarmatian or Scythian Hunns, with whom they had no intercourse, nor the least resemblance either in their persons or manners. They were a powerful nation, and often served against the Romans in the Persian armies; but in the reign of the emperor Zeno, being provoked by Perozes king of Persia laying claim to part of their country, they defeated the Persians in two pitched battles, slew their king, overran all Persia, and held it in subjection for the space of two years, obliging Cabades, the son and successor of Perozes, to pay them a yearly tribute. These Hunns, called by the writers of those times the *white Hunns*, did not wander, like the others, from place to place; but, contented with their own country, which supplied them with all necessaries, they lived under a regular government, subject to one prince, and seldom made inroads, unless provoked, either into the Persian or Roman territories. They lived according to their own laws, and dealt uprightly with one another, as well as with the neighbouring people. Each of their great men used to choose twenty or more companions to enjoy with him his wealth, and partake of all his diversions; but, upon his decease, they were all buried with him in the same grave. This custom savours of barbarity; but in every other respect, the Nephthalite were a far more civilized nation than the Scythian Hunns, who, breaking into the empire, filled most of the provinces of Europe with blood and slaughter.

The latter were, according to Ammianus Marcellinus, a savage people, exceeding in cruelty the most barbarous nations. They begin to practise their cruelty, says Jornandes, upon their own children the very first day they come into the world, cutting and mangling the cheeks of their males, to prevent the growth of hair, which they must have looked upon, contrary to the sentiments of other nations, as unbecoming and unmanly. They had, perhaps, in this practice another view, which Jornandes seems to insinuate elsewhere, viz. to strike terror into the enemy with their countenances, thus deformed and covered with scars. They had no other food but roots and raw meat, being quite unacquainted with the use of fire, and no houses at all, not even huts; but lived constantly exposed to the air in the woods, and on the mountains, where, from their infancy, they were inured to hunger, thirst, and all manner of hardships: nay, they had such an aversion to houses, which they called the *sepulchres of the living*, that, when they went into other countries, they could hardly be prevailed upon to come within the walls of any house, not thinking themselves safe when shut up and covered. They used even to eat and sleep on horseback, scarce ever dismounting; which, in all likelihood, induced Zosimus to write, that the Hunns could not walk. They covered their nakedness with goats skins, or the skins of a sort of mice sewed together. Day and night were indifferent to them, as to buying, selling, eating, and drinking. They had no law, nor any kind of religion; but complied with their inclinations, whatever they prompted them to, without the least restraint, or distinction between good and evil. In war, they began the battle with great fury, and a hideous noise: but if they met with a vigorous opposition, their

Hunter.

their fury began to abate after the firſt onſet; and when once put into diſorder, they never rallied, but fled in the utmoſt confuſion. They were quite unacquainted with the art of beſieging towns; and authors obſerve, that they never attacked the enemy's camp. They were a faithleſs nation, and thought themſelves no longer bound by the moſt ſolemn treaties, than they found their advantage in obſerving them. Hence we often find them, upon the leaſt proſpect of obtaining more advantageous conditions, breaking into the Roman empire, in defiance of the moſt ſolemn oaths and engagements. Several corps of Hunns, after their coming into Europe, ſerved in the Roman armies againſt the Goths and other barbarous nations; nay, they were ready, for hire, to fight againſt each other, being blind to every other regard and conſideration.

HUNTER, a name given to a horſe qualified to carry a perſon in the chace. The ſhape of the horſe deſigned for this ſervice, ſhould be ſtrong and well knit together, as the jockeys expreſs it. Irregular or unequal ſhapes in theſe creatures are always a token of weakneſs. The inequalities in ſhape which ſhow a horſe improper for the chace, are the having a large head and a ſmall neck, a large leg and a ſmall foot, and the like. The head of the hunter ſhould indeed always be large, but the neck ſhould alſo be thick and ſtrong to ſupport it. The head ſhould be lean, the noſtrils wide, and the windpipe ſtraight.

The hunter, in order to his behaving well in the field, ought to have great care and indulgence in the ſtable: he ought to have as much reſt and quiet as may be, to be kept well ſupplied with good meat, clean litter, and freſh water by him; he ſhould be often dreſſed, and ſuffered to ſleep as much as he pleaſes. He ſhould be ſo fed, that his dung may be rather ſoft than hard, and it muſt be of a bright and clean colour. All this may be eaſily managed by the continual obſervance and change of his food, as occaſion requires. After his uſual ſcourings he ſhould have exerciſes and maſhes of ſweet malt, or bread and beans; or wheat and beans mixed together, are to be his beſt food, and beans and oats his worſt.

Some very great ſportſmen are for keeping their horſes out at graſs all the buck-hunting ſeaſon, never taking them up into the ſtable at all, but allowing them in the field as much oats with their graſs as they will eat. The horſe may be thus rid three days in the week for the whole ſeaſon, and never damaged by it, nor ever ſhowing any marks of harm afterwards.

The whole ſhape of a horſe intended for a hunter, ſhould be this: The ears ſhould be ſmall, open, and pricked; or though they be ſomewhat long, yet if they ſtand up erect and bold like thoſe of a fox, it is a ſign of toughneſs or hardineſs. The forehead ſhould be long and broad, not flat, or, as it is uſually termed, *mare-faced*, but riſing in the middle like that of a hare; the feather ſhould be placed above the eye, the contrary being thought by ſome to threaten blindneſs. The eyes ſhould be full, large, and bright; the noſtrils not only large, but looking red and freſh within; for an open and freſh noſtril is always eſteemed a ſign of a good wind. The mouth ſhould be large, deep in the wicks, and hairy. The wind-pipe ſhould be large, and appear ſtraight when he bridles his head; for if, on the contrary, it bends like a bow on his bridling, it is not formed for a free paſſage of the breath. This defect in a horſe is expreſſed among the dealers by the phraſe *cock-throppled*. The head ſhould be ſo ſet on to the neck, that a ſpace may be felt between the neck and the chine; when there is no ſuch ſpace, the horſe is ſaid to be bull-necked; and this is not only a blemiſh in the beauty of the horſe, but it alſo occaſions his wind not to be ſo good. The creſt ſhould be ſtrong, firm, and well riſen; the neck ſhould be ſtraight and firm, not looſe and pliant; the breaſt ſhould be ſtrong and broad, the ribs round like a barrel, the fillets large, the buttocks rather oval than broad, the legs clean, flat, and ſtraight; and, finally, the mane and tail ought to be long and thin, not ſhort and buſhy, the laſt being counted a mark of dulneſs. When a hunter is thus choſen, and has been taught ſuch obedience, that he will readily anſwer to the rider's ſignals both of the bridle and hand, the voice, the calf of the leg, and the ſpurs; that he knows how to make his way forward, and has gained a true temper of mouth, and a right placing of his head, and has learned to ſtop and to turn readily, if his age be ſufficiently advanced, he is ready for the field. It is a rule with all ſtaunch ſportſmen, that no horſe ſhould be uſed in hunting till he is full five years old; ſome will hunt them at four, but the horſe at this time is not come up to his true ſtrength and courage, and will not only fail at every tough trial, but will be ſubject to ſtrains and accidents of that kind, much more than if he were to be kept another year firſt, when his ſtrength would be more confirmed.

When the hunter is five years old, he may be put to graſs from the middle of May till Bartholomew-tide; for the weather between theſe is ſo hot, that it will be very proper to ſpare him from work. At Bartholomew-tide, the ſtrength of the graſs beginning to be nipped by froſts and cold dews, ſo that it is apt to engender crudities in the horſe, he ſhould be taken up while his coat is yet ſmooth and ſleek, and put into the ſtable. When he is firſt brought home, he ſhould be put in ſome ſecure and ſpacious place, where he may evacuate his body by degrees, and be brought not all at once to the warm keeping; the next night he may be ſtabled up. It is a general rule with many not to clothe and ſtable up their horſes till two or three days after they are taken from graſs, and others who put them in the ſtable after the firſt night, yet will not dreſs and clothe them till three or four days afterward; but all this, except the keeping the horſe one day in a large and cool place, is needleſs caution.

There is a general practice among the grooms, in many places, of giving their hunters wheat-ſtraw as ſoon as they take them up from graſs. They ſay they do this to take up their bellies; but there ſeems much reaſon to diſapprove of this. The change is very violent, and the nature of the ſtraw ſo heating and drying, that there ſeems great reaſon to fear that the aſtringent nature of it would be prejudicial, more than is at firſt perceived. It is always found that the dung is hard after this food, and is voided with pain and difficulty, which is in general very wrong for this ſort of horſe. It is better therefore to avoid this ſtraw-feeding, and to depend upon moderate airing, warm clothing, and good old hay and old corn, than to have recourſe to any thing of this kind.

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When the horse has evacuated all his grass, and has been properly shod, and the shoes have had time to settle to his feet, he may be ridden abroad, and treated in this manner: the groom ought to visit him early in the morning, at five o'clock in the long days, and at six in the short ones; he must then clean out the stable, and feel the horse's neck, flank, and belly, to find the state of his health. If the flank feels soft and flabby, there is a necessity of good diet to harden it, otherwise any great exercise will occasion swellings and goutiness in the heels. After this examination, a handful or two of good old oats, well sifted, should be given him; this will make him have more inclination to water, and will also make the water sit better on his stomach, than if he drank fasting. After this he is to be tied up and dressed. If in the doing of this he opens his mouth, as if he would bite, or attempts to kick at the person, it is a proof that the teeth of the currycomb are too sharp, and must be filed blunter. If after this he continues the same tricks, it is through wantonness, and he should be corrected for it with the whip. The intent of currying being only to raise the dust, this is to be brushed off afterwards with a horse-tail nailed to a handle, or any other light brush. Then he is to be rubbed down with the brush, and dusted a scond time; he should then be rubbed over with a wet hand, and all the loose hairs, and whatever foulness there is, should be picked off. When this is done, and he is wiped dry as at first, a large saddle-cloth is to be put on, reaching down to the spurring place; then the saddle is to be put on, and a cloth thrown over it that he may not take cold: then rub down his legs, and pick his feet with an iron picker, and let the mane and tail be combed with a wet mane-comb. Lastly, it is a custom to spurt some beer in his mouth just before the leading him out of the stable. He should then be mounted, and walked a mile at least to some running water, and there watered; but he must only be suffered to take about half his water at one drinking.

It is the custom of many to gallop the horse at a violent rate as soon as he comes out of the water; but this is extremely wrong for many reasons. It endangers the breaking a horse's wind more than any other practice, and often has been the occasion of bursting very good horses. It uses them also to the disagreeable trick we find in many horses, of running away as soon as ever they come out of the water: and with some it makes them averse to drinking, so that they will rather endure thirst, and hurt themselves greatly by it, than bring on the violent exercise which they remember always follows it. The better way is to walk him a little after he is out of the water, then put him to a gentle gallop for a little while, and after this to bring him to the water again. This should be done three or four times, tlll he will not drink any more. If there is a hilly place near the watering place, it is always well to ride up to it; if otherwise, any place is to be chosen where there is free air and sun. That the creature may enjoy the benefit of this, he is not to be galloped, but walked about in this place an hour, and then taken home to the stable. The pleasure the horse himself takes in these airings when well managed is very evident; for he will gape, yawn, and shrug up his body: and in these, whenever he would stand still to stale, dung, or listen to any noise, he is not to be hindered from it, but encouraged in every thing of this kind.

The advantages of these airings are very evident; they purify the blood, teach the creature how to make his breathing agree with the rest of the motions of his body, and give him an appetite to his food, which hunters and racers that are kept stalled up are otherwise very apt to lose. On returning from airing, the litter of the stable should be fresh, and by stirring this and whistling, he will be brought to stale. Then he is to be led to his stall, and tied up, and again carefully rubbed down; then he should be covered with a linen cloth next his body, and a canvas one over that, made to fit him, and reaching down to his legs. This, as the duke of Newcastle observes, is a custom which we learned of the Turks, who are of all people the most nice and careful of their horses. Over this covering there should be put a body-cloth of six or eight straps; this keeps his belly in shape, and does not hurt him. This clothing will be sufficient while the weather is not very sharp; but in severe seasons, when the hair begins to rise and start in the uncovered parts, a woollen cloth is to be added, and this will always prove fully sufficient.

Different horses, and different seasons, make variety of the degree of clothing necessary; but there always is an obvious rule to point out the necessary changes, the roughness of the coat being a mark of the want of clothing, and the smoothness of it a proof that the clothing is sufficient. Therefore if at any time the hair is found to start, it is a notice that some farther clothing is to be added.

If the horse sweat much in the night, it is a sign that he is over fed and wants exercise; this therefore is easily remedied. An hour or more after the horse is come in from his airing, the groom should give him a wisp of clean hay, making him eat it out of his hand; after this let the manger be well cleaned out, and a quartern of oats clean sifted be given him. If he eats up this with an appetite, he should have more given him; but if he is slow and indifferent about it, he must have no more. The business is to give him enough, but not to cloy him with food.

If the horse gets flesh too fast on this home feeding, he is not to be stinted to prevent it, but only his exercise increased; this will take down his flesh, and at the same time give him strength and wind. After the feeding in the morning is over the stable is to be shut up, only leaving him a little hay on his litter. He need be no more looked at till one o'clock, and then only rubbed down, and left again to the time of his evening watering, which is four o'clock in the summer and three in the winter. When he has been watered, he must be kept out an hour or two, or more if necessary, and then taken home and rubbed as after the morning watering. Then he is to have a feed of corn at six o'clock, and another at nine at night; and being then cleaned, and his litter put in order, and hay enough left for the night, he is to be left till morning. This is the direction for one day, and in this manner he is to be treated every day for a fortnight; at the end of which time his flesh will be so hardened, his wind so improved, and his mouth so quickened, and his gallop brought to so good a stroke, that he will be fit to be put to moderate hunting. During the time that he is used

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ufed to hunting, he muft be ordered on his days of reft exactly as he is directed for the fortnight when he is in preparation; but as his exercife is now greatly increafed, he muft be allowed a more ftrengthening food, mixing fome old fplit beans at every feeding with his oats.

And if this is not found to be fufficient, the following bread muft be given: let two pecks of old beans and one peck of wheat be ground together, and made into an indifferently fine meal; then knead it into dough with fome warm water and a good quantity of yeaft; let it lie a time that it may rife and fwell, which will make the bread the lighter; then make it into loaves of a peck each, and let it be baked in a flow oven, that it may be thoroughly done without being burnt; when it is taken out of the oven, it muft be fet bottom upwards to cool; when it is one day old the cruft is to be chipped off, and the crumb given him for food. When this is ready, he fhould have fome of it at leaft once in the day: but it is not to be made the only food, but fome feeds are to be of oats alone, fome of oats and this bread, and fome of oats and beans mixed together. The making a variety in this manner being the beft of all methods for keeping up the appetite, which is often apt to fail.

The day before the horfe is to hunt, he muft have no beans, becaufe they are hard of digeftion, but only fome oats with this bread: or if he will be brought to eat the bread alone, that will be beft of all. His evening feed fhould on this day be fomewhat earlier than ufual; and after this he is only to have a wifp of hay out of the groom's hand till he return from hunting.

HUNTER, *Dr William*, a celebrated anatomift and phyfician, was born on the 23d of May 1718, at Kilbride in the county of Lanerk in Scotland. He was the feventh of the children of John and Agnes Hunter, who refided on a fmall eftate in that parifh called *Long Calderwood*, which had been long in the poffeffion of his family. His great grandfather by his father's fide, was a younger fon of Hunter of Hunterfton, chief of the family of that name. At the age of fourteen his father fent him to the college of Glafgow. In this feminary he paffed five years, and by his prudent behaviour and diligence acquired the efteem of the profeffors, and the reputation of being a good fcholar. His father had defigned him for the church: but the idea of fubfcribing to articles of faith was fo repugnant to the liberal mode of thinking he had already adopted, that he felt an infuperable averfion to his theological purfuits. In this ftate of mind he happened to become acquainted with Dr Cullen, the late celebrated profeffor at Edinburgh, who was then juft eftablifhed in practice at Hamilton under the patronage of the duke of Hamilton. Dr Cullen's converfation foon determined him to lay afide all thoughts of the church, and to devote himfelf to the profeffion of phyfic. His father's confent having been previoufly obtained, Mr Hunter in 1737 went to refide with Dr Cullen. In the family of this excellent friend and preceptor he paffed nearly three years: and thefe, as he has been often heard to acknowledge, were the happieft years of his life. It was then agreed, that he fhould go and profecute his medical ftudies at Edinburgh and London, and afterwards return to fettle at Hamilton in partnerfhip with Dr Cullen. He accordingly fet out for Edinburgh in November 1740; and continued there till the following fpring, attending the lectures of the medical profeffors, and amongft others thofe of the late Dr Alexander Monro, who many years afterwards, in allufion to this circumftance, ftyled himfelf his *old mafter*.

Dr Foart Simmons's account of the life and writings of Dr W. Hunter.

Mr Hunter arrived in London in the fummer of 1741, and took up his refidence at Mr, afterwards Dr, Smellie's, who was at that time an apothecary in Pall Mall. He brought with him a letter of recommendation to his countryman Dr James Douglas, from Mr Foulis printer at Glafgow, who had been ufeful to the doctor in collecting for him different editions of Horace. Dr Douglas was then intent on a great anatomical work on the bones, which he did not live to complete, and was looking out for a young man of abilities and induftry whom he might employ as a diffector. This induced him to pay particular attention to Mr Hunter; and finding him acute and fenfible, he defired him to make him another vifit. A fecond converfation confirmed the doctor in the good opinion he had formed of Mr Hunter; and without any farther hefitation he invited him into his family to affift in his diffections and to fuperintend the education of his fon.—Mr Hunter having accepted Dr Douglas's invitation, was by his friendly affiftance enabled to enter himfelf as a furgeon's pupil at St George's Hofpital under Mr James Wilkie, and as a diffecting pupil under Dr Frank Nichols, who at that time taught anatomy with confiderable reputation. He likewife attended a courfe of lectures on experimental philofophy by Dr Defaguliers. Of thefe means of improvement he did not fail to make a proper ufe. He foon became expert in diffection, and Dr Douglas was at the expence of having feveral of his preparations engraved. But before many months had elapfed, he had the misfortune to lofe this excellent friend.—The death of Dr Douglas, however, made no change in the fituation of our author. He continued to refide with the doctor's family, and to purfue his ftudies with the fame diligence as before.

In 1743 he communicated to the Royal Society an effay on the Structure and Difeafes of articulating Cartilages. This ingenious paper, on a fubject which till then had not been fufficiently inveftigated, affords a ftriking teftimony of the rapid progrefs he had made in his anatomical inquiries. As he had it in contemplation to teach anatomy, his attention was directed principally to this object; and it deferves to be mentioned as an additional mark of his prudence, that he did not precipitately engage in this attempt, but paffed feveral years in acquiring fuch a degree of knowledge and fuch a collection of preparations, as might infure him fuccefs. Dr Nichols, to whom he communicated his fcheme, and who declined giving lectures about that time in favour of the late Dr Lawrence, did not give him much encouragement to profecute it. But at length an opportunity prefented itfelf for the difplay of his abilities as a teacher. A fociety of navy furgeons had an apartment in Covent Garden, where they engaged the late Mr Samuel Sharpe to deliver a courfe of lectures on the operations of furgery. Mr Sharpe continued to repeat this courfe, till finding that it interfered too much with his other engagements,

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engagements, he declined the task in favour of Mr Hunter; who gave the society so much satisfaction, that they requested him to extend his plan to anatomy, and at first he had the use of their room for his lectures. This happened in the winter of 1746. He is said to have experienced much solicitude when he began to speak in public: but the applause he met with soon inspired him with courage; and by degrees he became so fond of teaching, that for many years before his death he was never happier than when employed in delivering a lecture. The profits of his two first courses were considerable; but by contributing to the wants of different friends, he found himself at the return of the next season obliged to defer his lectures for a fortnight, merely because he had not money enough to defray the necessary expence of advertisements.

In 1747 he was admitted a member of the corporation of surgeons; and in the spring of the following year, soon after the close of his lectures, he set out in company with his pupil, Mr James Douglas, on a tour through Holland to Paris. His lectures suffered no interruption by this journey, as he returned to England soon enough to prepare for his winter-course, which began about the usual time.

At first he practised both surgery and midwifery; but to the former of these he had always an aversion. His patron, Dr James Douglas, had acquired considerable reputation in midwifery; and this probably induced Mr Hunter to direct his views chiefly to the same line of practice. His being elected one of the surgeon men-midwives, first to the Middlesex, and soon afterwards to the British Lying-in Hospital, assisted in bringing him forward in this branch of his profession, in which he was recommended by several of the most eminent surgeons of that time, who respected his anatomical talents and wished to encourage him. But these were not the only circumstances that contributed to his success. He owed much to his abilities, and much to his person and manner, which eminently qualified him for the practice of midwifery.

In 1750 he seems to have entirely relinquished his views in surgery; as in that year he obtained the degree of Doctor of Physic from the university of Glasgow, and began to practise as a physician. About this time he quitted the family of Mrs Douglas, and went to reside in Jermyn-street. In the summer of 1751 he revisited his native country, for which he always retained a cordial affection. His mother was still living at Long Calderwood, which was now become his property by the death of his brother James. Dr Cullen, for whom he always entertained a sincere regard, was then established at Glasgow, and had acquired considerable reputation both as a practitioner and teacher of physic; so that the two friends had the pleasure of being able to congratulate each other on their mutual prosperity. During this visit he showed his attachment to his little paternal inheritance by giving many instructions for repairing and improving it, and for purchasing any adjoining lands that might be offered for sale. After this journey to Scotland, to which he devoted only a few weeks, he was never absent from London, unless his professional engagements, as sometimes happened, required his attendance at a distance from the capital.

In 1755, on the resignation of Dr Layard, one of the physicians of the British lying-in hospital, we find the governors of that institution voting their "thanks to Dr Hunter for the services he had done the hospital, and for his continuing in it as one of the physicians:" so that he seems to have been established in this office without the usual form of an election. The year following he was admitted a licentiate of the Royal College of Physicians. Soon afterwards he was elected a member of the Medical Society; and to the *Observations and Inquiries* published by that society, he at different periods contributed several valuable papers.

In 1762, we find him warmly engaged in controversy, supporting his claim to different anatomical discoveries, in a work entitled Medical Commentaries, the style of which is correct and spirited. As an excuse for the tardiness with which he brought forth this work, he observes in his introduction, that it required a good deal of time, and he had little to spare; that the subject was unpleasant, and therefore he was very seldom in the humour to take it up. In this publication he confined himself chiefly to a dispute with the present learned professor of anatomy at Edinburgh, concerning injections of the testicle, the ducts of the lachrymal gland, the origin and use of the lymphatic vessels, and absorption by veins. He likewise defended himself against a reproach thrown upon him by Professor Monro senior, by giving a concise account of a controversy he was involved in with Mr Pott concerning the discovery of the Hernia Congenita. It was not long before Mr Pott took occasion to give the public his account of the dispute; and, in reply, Dr Hunter added a supplement to his commentaries. No man was ever more tenacious than Dr Hunter of what he conceived to be his anatomical rights. This was particularly evinced in the year 1780, when his brother communicated to the Royal Society a discovery he had made 25 years before, relative to the structure of the placenta, the communication between it and the uterus, and the vascularity of the spongy chorion. At the next meeting of the society, a letter was read, in which Dr Hunter put in his claim to the discovery in question. This letter was followed by a reply from Mr John Hunter, and here the dispute ended.

In 1762, when the queen became pregnant, Dr Hunter was consulted: and two years afterwards he had the honour to be appointed physician extraordinary to her majesty.

About this time his avocations were so numerous, that he became desirous of lessening his fatigue; and having noticed the ingenuity and assiduous application of the late Mr William Hewson, F. R. S. who was then one of his pupils, he engaged him first as an assistant, and afterwards as a partner in his lectures. This connection continued till the year 1770, when some dispute happened, which terminated in a separation. Mr Hewson was succeeded in the partnership by Mr Cruikshank, whose anatomical abilities were deservedly respected.

In 1767, Dr Hunter was elected a fellow of the Royal Society: and in the year following communicated to that learned body observations on the bones, commonly supposed to be elephants bones, which have been found near the river Ohio in America. This was not the only subject of natural history on which our

Hunter. our author employed his pen; for in a subsequent volume of the Philosophical Transactions, we find him offering his remarks on some bones found in the rock of Gibraltar, and which he proves to have belonged to some quadruped. In the same work, likewise, he published an account of the nyl-ghau, an Indian animal not described before. In 1768, Dr Hunter became a fellow of the Society of Antiquaries; and the same year, at the institution of a Royal Academy of Arts, he was appointed by his majesty to the office of professor of anatomy. This appointment opened a new field for his abilities; and he engaged in it, as he did in every other pursuits of his life with unabating zeal. He now adapted his anatomical knowledge to the objects of painting and sculpture, and the novelty and justness of his observations proved at once the readiness and extent of his genius. In January 1781, he was unanimously elected to succeed the late Dr John Fothergill as president of the Medical Society. As his name and talents were known and respected in every part of Europe, so the honours conferred on him were not limited to his own country. In 1780, the Royal Medical Society at Paris elected him one of their foreign associates; and in 1782, he received a similar mark of distinction from the Royal Academy of Sciences in that city.

The most splendid of Dr Hunter's medical publications was the Anatomy of the Human Gravid Uterus. The appearance of this work, which had been begun so early as the year 1751 (at which time 10 of the 34 plates it contains were completed), was retarded till the year 1775, only by the author's desire of sending it into the world with fewer imperfections. This great work is dedicated to the king. In his preface to it, we find the author very candidly acknowledging, that in most of the dissections he had been assisted by his brother Mr John Hunter, "whose accuracy (he adds) in anatomical researches is so well known, that to omit this opportunity of thanking him for that assistance would be in some measure to disregard the future reputation of the work itself." He likewise confesses his obligations to the ingenious artists who made the drawings and engravings; "but particularly to Mr Strange, not only for having by his hand secured a sort of immortality to two of the plates, but for having given his advice and assistance in every part with a steady and disinterested friendship. An anatomical description of the gravid uterus was a work which Dr Hunter had in contemplation to give the public. He had likewise long been employed in collecting and arranging materials for a history of the various concretions that are formed in the human body. Amongst Dr Hunter's papers have been found two introductory lectures, which are written out so fairly, and with such accuracy, that he probably intended no farther correction of them before they should be given to the world. In these lectures Dr Hunter traces the history of anatomy from the earliest to the present times, along with the general progress of science and the arts. He considers the great utility of anatomy in the practice of physic and surgery; gives the ancient divisions of the different substances composing the human body, which for a long time prevailed in anatomy; points out the most advantageous mode of cultivating this branch of natural knowledge; and concludes with explaining the particular plan of his own lectures. Besides these manuscripts, he has also left behind him a considerable number of cases of dissection; mostly relating to pregnant women. Hunter.

The same year in which the Tables of the Gravid Uterus made their appearance, Dr Hunter communicated to the Royal Society an Essay on the Origin of the Venereal Disease. In this paper he attempted to prove, that this dreadful malady was not brought from America to Europe by the crew of Columbus, as had been commonly supposed, although it made its first appearance about that period. After this paper had been read to the Royal Society, Dr Hunter, in a conversation with the late Dr Musgrave, was convinced that the testimony on which he placed his chief dependence was of less weight than he had at first imagined, as many of Martyr's letters afford the most convincing proofs of their having been written a considerable time after the period of their dates. He therefore very properly laid aside his intention of giving his essay to the public. In the year 1777 Dr Hunter joined with Mr Watson in presenting to the Royal Society a short account of the late Dr Maty's illness, and of the appearances on dissection; and the year following he published his Reflections on the Section of the Symphysis Pubis.

We must now go back a little in the order of time to describe the origin and progress of Dr Hunter's museum, without some account of which the history of his life would be very incomplete.

When he began to practise midwifery, he was desirous of acquiring a fortune sufficient to place him in easy and independent circumstances. Before many years had elapsed, he found himself in possession of a sum adequate to his wishes in this respect; and this he set apart as a resource of which he might avail himself whenever age or infirmities should oblige him to retire from business. After he had obtained this competency, as his wealth continued to accumulate, he formed a laudable design of engaging in some scheme of public utility, and at first had it in contemplation to found an anatomical school in this metropolis. For this purpose, about the year 1775, during the administration of Mr Grenville, he presented a memorial to that minister, in which he requested the grant of a piece of ground in the Mews, for the site of an anatomical theatre. Dr Hunter undertook to expend 7000l. on the building, and to endow a professorship of anatomy in perpetuity. This scheme did not meet with the reception it deserved. In a conversation on this subject soon afterwards with the earl of Shelburne, his lordship expressed a wish that the plan might be carried into execution by subscription, and very generously requested to have his name set down for a thousand guineas. Dr Hunter's delicacy would not allow him to adopt this proposal. He chose rather to execute it at his own expence; and accordingly purchased a spot of ground in Great Windmill-street, where he erected a spacious house, to which he removed from Jermyn-street in 1770. In this building, besides a handsome amphitheatre and other convenient apartments for his lectures and dissections, there was one magnificent room, fitted up with great elegance and propriety as a museum. Of the magnitude and value of his anatomical collection some idea may be formed, when we consider the great length of years

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years he employed in the making of anatomical preparations and in the diffection of morbid bodies, added to the eagernefs with which he procured additions from the collections of Sandys, Hewfon, Falconer, Blackall, and others, that were at different times offered for fale in this metropolis. His fpecimens of rare difeafes were likewife frequently increafed by prefents from his medical friends and pupils; who, when any thing of this fort occurred to them, very juftly thought they could not difpofe of it more properly than by placing it in Dr Hunter's mufeum. Speaking of an acquifition in this way in one of his publications, he fays, "I look upon every thing of this kind which is given to me, as a prefent to the public; and confider myfelf as thereby called upon to ferve the public with more diligence."

Before his removal to Windmill-ftreet, he had confined his collection chiefly to fpecimens of human and comparative anatomy and of difeafes; but now he extended his views to foffils, and likewife to the promotion of polite literature and erudition. In a fhort fpace of time he became poffeffed of "the moft magnificent treafure of Greek and Latin books that has been accumulated by any perfon now living fince the days of Mead." A cabinet of ancient medals contributed likewife much to the richnefs of his mufeum. A defcription of part of the coins in this collection, ftruck by the Greek free cities, was afterwards publifhed by the Doctor's learned friend Mr Combe. In a claffical dedication of this elegant volume to the queen, Dr Hunter acknowledges his obligations to her majefty. In the preface fome account is given of the progrefs of the collection, which has been brought together fince the year 1770, with fingular tafte, and at the expence of upwards of 20,000l. In 1781, the mufeum received a valuable addition of fhells, corals, and other curious fubjects of natural hiftory, which had been collected by the late worthy Dr Fothergill, who gave directions by his will, that his collection fhould be appraifed after his death, that Dr Hunter fhould have the refufal of it at 500l. under the valuation. This was accordingly done, and Dr Hunter purchafed it for the fum of 1200l. The fame of this mufeum fpread throughout Europe. Few foreigners diftinguifhed for their rank or learning vifited this metropolis without requefting to fee it. Men of fcience of our own country always had eafy accefs to it.—Confidered in a collective point of view, it is perhaps without a rival.

Dr Hunter, at the head of his profeffion, honoured with the efteem of his fovereign, and in poffeffion of every thing that his reputation and wealth could confer, feemed now to have attained the fummit of his wifhes. But thefe fources of gratification were embittered by a difpofition to the gout, which haraffed him frequently during the latter part of his life, notwithftanding his very abftemious manner of living. On Saturday the 15th of March 1783, after having for feveral days experienced a return of a wandering gout, he complained of great head-ach and naufea. In this ftate he went to bed, and for feveral days felt more pain than ufual both in his ftomach and limbs. On the Thurfday following he found himfelf fo much recovered, that he determined to give the introductory lecture to the operations of furgery. It was to no purpofe that his friends urged to him the impropriety of fuch an attempt. He was determined to make the experiment, and accordingly delivered the lecture; but towards the conclufion his ftrength was fo exhaufted that he fainted away, and was obliged to be carried to bed by two fervants. The following night and day his fymptoms were fuch as indicated danger; and on Saturday morning Mr Combe, who made him an early vifit, was alarmed on being told by Dr Hunter himfelf, that during the night he had certainly had a paralytic ftroke. As neither his fpeech nor his pulfe were affected, and he was able to raife himfelf in bed, Mr Combe encouraged him to hope that he was miftaken. But the event proved the doctor's idea of his complaint to be but too well founded; for from that time till his death, which happened on Sunday the 30th of March, he voided no urine without the affiftance of the catheter, which was occafionally introduced by his brother; and purgative medicines were adminiftered repeatedly without procuring a paffage by ftool. Thefe circumftances, and the abfence of pain, feemed to fhow, that the inteftines aud urinary bladder had loft their fenfibility and power of contraction; and it was reafonable to prefume that a partial palfy had affected the nerves diftributed to thofe parts.

By his will, the ufe of his mufeum, under the direction of truftees, devolves to his nephew Matthew Baillie, B. A. and in cafe of his death to Mr Cruikfhank for the term of thirty years; at the end of which period the whole collection is bequeathed to the univerfity of Glafgow. The fum of eight thoufand pounds fterling is left as a fund for the fupport and augmentation of the collection.

Dr Hunter was regularly fhaped, but of a flender make, and rather below a middle ftature. His manner of living was extremely fimple and frugal, and the quantity of his food was fmall as well as plain. He was an early rifer; and when bufinefs was over, was conftantly engaged in his anatomical purfuits, or in his mufeum. There was fomething very engaging in his manner and addrefs; and he had fuch an appearance of attention to his patients, when he was making his inquiries, as could hardly fail to conciliate their confidence and efteem. In confultation with his medical brethren, he delivered his opinions with diffidence and candour. In familiar converfation he was cheerful and unaffuming. As a teacher of anatomy he has been long and defervedly celebrated. He was a good orator; and having a clear and accurate conception of what he taught, he knew how to place in diftinct and intelligible points of view the moft abftrufe fubjects of anatomy and phyfiology. Among other methods of explaining and illuftrating his doctrines, he ufed frequently to introduce fome appofite ftory or cafe that had occurred to him in his practice; and few men had acquired a more interefting fund of anecdotes of this kind, or related them in a more agreeable manner.

Hunter, *John*, an eminent furgeon, was the youngeft child of John Hunter of Kilbride, in the county of Lanerk. He was born at Long Calderwood on the 13th of July 1728. His father died when he was about ten years of age, from which circumftance his mother was induced to grant him too much indulgence. In confequence he made no progrefs at the grammar-fchool, and was almoft wholly illiterate at the age of 20, when he

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he arrived in London. His brother Dr W. Hunter, was at that time the moſt eminent teacher of anatomy, and John expreſſed a wiſh to aſſiſt him in his reſearches. The doctor, anxious to make trial of his talents, gave him an arm to diſſect for the muſcles, with proper inſtructions how it was to be performed; and the dexterity with which he managed his undertaking exceeded the expectations of his brother.

Having acquired ſome reputation from this firſt attempt, his brother employed him in a more difficult diſſection, which was an arm wherein all the arteries were injected, and theſe and the muſcles were to be preſerved and expoſed. In the execution of this taſk he alſo gave the higheſt ſatisfaction, and his brother predicted that he would become a good anatomiſt, and never want employment. Under the inſtructions of his brother and Mr Symonds his aſſiſtant, he enjoyed every favourable opportunity of increaſing his anatomical knowledge, ſince that ſchool monopolized all the diſſections then carried on in London.

He was admitted into partnerſhip with his brother in the winter of 1755, and a certain department of the lectures was allotted to him, and he alſo lectured when the doctor was called away to attend his patients. The mind of Mr Hunter was peculiarly fitted for the ſtudy of anatomy, and the indefatigable ardour with which he proſecuted it, is ſcarcely to be equalled. He applied to human anatomy for ten years, during which period he made himſelf maſter of every thing then known, and alſo made ſome conſiderable additions. He was the firſt who diſcovered the exiſtence of the lymphatic veſſels in birds.

With ſuch eagerneſs did he apply himſelf to the ſtudy of comparative anatomy, that he even applied to the keeper of wild beaſts in the Tower for the bodies of ſuch as died there, and to all thoſe who were in the habit of exhibiting wild beaſts to the public. He made a purchaſe of every rare animal that came in his way, which, together with thoſe preſented to him by his friends, he gave to the ſhowmen to keep till they died, the more effectually to prevail with them to aſſiſt him in his labours. So much was his health impaired by unwearied attention to his favourite purſuits, that in 1760 his friends adviſed him to go abroad, as he exhibited many ſymptoms of an incipient conſumption. In October that year he was appointed a ſurgeon on the ſtaff by the inſpector-general of hoſpitals (Mr Adair) and in the ſpring of the enſuing year he went to Belleiſle with the army.

He ſerved during the continuance of the war, as ſenior ſurgeon on the ſtaff, when he acquired his knowledge of gun-ſhot wounds. He ſettled in London on his return to England; but finding that his half pay and private practice could not ſupport him, he taught practical anatomy and ſurgery for ſeveral winters. He built a houſe near Brompton, where he purſued the ſtudy of comparative anatomy with unabated ardour. He diſcovered the changes which animal and vegetable ſubſtances undergo in the ſtomach by the action of the gaſtric juice; the mode in which a bone retains its ſhape during its growth; and explained the proceſs of exfoliation, by which a dead piece of bone is ſeparated from the living.

On the 5th of February 1767, he was choſen F. R. S. In the year 1768 he became a member of the incorporation of ſurgeons, and in the following year was elected one of the ſurgeons of St George's hoſpital, through the influence of his brother. He publiſhed his treatiſe on the natural hiſtory of the teeth in May 1771, and in July the ſame year he married Miſs Home, daughter of Mr Home, ſurgeon to Burgoyne's regiment of light horſe. His private practice and profeſſional reputation advanced with rapidity after his marriage, and although his family increaſed, he devoted much of his time to the forming of his collection. He diſcovered the cauſe of failure in the cure of every caſe of hydrocele, and propoſed a mode of operating in which that event may certainly be avoided. He aſcertained that ſimple expoſure to the air can neither produce nor increaſe inflammation; and he conſidered the blood as alive in its fluid ſtate. He alſo diſcovered that the ſtomach after death is ſometimes acted on and diſſolved by the gaſtric juice, reſpecting which he communicated a paper to the Royal Society.

Comparative anatomy occupied the greater part of his time and attention, and he ſuffered no opportunity to eſcape him. He diſſected the torpedo in 1773, and laid an account of its electrical organs before the Royal Society. A young elephant which had been preſented to the queen, having died, it was given to Dr Hunter, which afforded our author an opportunity of examining the ſtructure of that monſtrous animal, as did alſo two others which died in the queen's menagerie. In the year 1774, he publiſhed an account in the Philoſophical Tranſactions, of certain receptacles of air in birds, communicating with the lungs, and lodged in the muſcular parts and hollow bones of theſe animals. Several animals belonging to the ſpecies called *Gymnotus electricus* of Surinam having been brought alive to Britain in 1775, their electrical properties excited a conſiderable ſhare of the public attention, and Mr Hunter purchaſed many of them after they died, for the purpoſe of proſecuting his favourite experiments. He publiſhed an account of their electrical organs in the Philoſophical Tranſactions for 1775; and in the ſame volume appeared his experiments on the power of animals and vegetables to produce heat.

Mr Hunter was appointed ſurgeon extraordinary to his majeſty in 1776; in the autumn of which year he grew extremely ill, when both himſelf and his friends apprehended that his life was in danger, but he happily recovered ſo far as to be able to publiſh the ſecond part of his treatiſe on the Teeth in 1778, which completed the ſubject; and in 1779 he publiſhed in the Philoſophical Tranſactions his account of the Free Martin. He was choſen a fellow of the Royal Society of Sciences and Belles Lettres at Gottenburg, and in 1783 he became a member of the Royal Society of Medicine and the Royal Academy of Surgery in Paris.

In the building which he formed for his valuable collection, there was a room 52 feet by 28, lighted from the top, with a gallery all round, for containing his preparations. At this time he had reached the height of his career as a ſurgeon, with his mind and body in full vigour; and his hands were capable of performing whatever was ſuggeſted by his capacious mind, and his judgment was fully ripened by long experience.

He removed a tumor from the head and neck of a patient in St George's Hoſpital, as large as the head to which it was attached; and by bringing the cut edges

edges of the ſkin into contact, the whole was almoſt healed by the firſt intention. He diſſected or cut out a tumor on the neck, which one of the beſt ſurgeons in this country declared that none but a fool or a madman would ever attempt; yet the patient perfectly recovered. He diſcovered a new method of performing the operation for the popliteal aneuriſm, by taking up the femoral artery on the anterior part of the thigh, without doing any thing to the tumor or the ham. This, from many ſubſequent experiments which have been ſucceſsfully performed, muſt be allowed to ſtand high among the modern improvements in ſurgery.

Mr Hunter was engaged in a very extenſive private practice; he was ſurgeon to St George's Hoſpital; he gave a very long courſe of lectures during the winter ſeaſon; he carried on his inquiries in comparative anatomy; he had a ſchool of practical human anatomy in his own houſe, and was continually employed in ſome experiments reſpecting the animal economy. In 1786 he was choſen deputy ſurgeon-general to the army, at which time he publiſhed his work on the venereal diſeaſe, the firſt edition of which met with a very rapid ſale.

In the year 1787 he publiſhed a treatiſe on the effect of extirpating one ovarium on the number of young, which procured him the annual gold medal of Sir John Copley. His collection was now brought into a ſtate of arrangement, which he ſhewed to his friends and acquaintances twice a year, and in May to noblemen and gentlemen, who were only in town during the ſpring. When Mr Adair died, Mr Hunter was appointed inſpector-general of hoſpitals, and ſurgeon-general to the army. This event happened in 1792, at which time he was elected honorary-member of the Chirurgo-Phyſical Society of Edinburgh, and one of the vice-preſidents of the Veterinary College of London, then firſt eſtabliſhed. He publiſhed alſo three papers on the treatment of inflamed veins, on introſuſception, and on the mode of conveying food into the ſtomach in caſes of paralyſis of the œſophagus.

The collection of comparative anatomy left by Mr Hunter remains an unequivocal teſtimony of his perſeverance and abilities, and an honour to the country in which he was educated. In it is beheld the natural gradation from the loweſt ſtate in which life is found to exiſt, up to the moſt perfect and complex of the animal creation—man himſelf.

Mr Hunter enjoyed a good ſtate of health, for the firſt 40 years of his life, during which he had no complaint of any conſequence, except an inflammation of his lungs in 1759. The firſt attack of the gout which he ever experienced was occaſioned by an affection of the mind, and every ſubſequent fit originated from the ſame ſource.

Mr Hunter was of a ſhort ſtature, uncommonly ſtrong and active, well formed, and capable of great bodily exertion. His countenance was open, animated, and deeply impreſſed with thoughtfulneſs towards the cloſe of his life. Lavater ſeeing a print of him, is ſaid to have exclaimed, that man thinks for himſelf." For the laſt twenty years of his life he drank nothing ſtronger than water, and wine at no period agreed with his ſtomach. He was eaſily irritated, but not ſoon pacified when once provoked. He was an enemy to diſſimulation, and free even to a fault. Few men require ſo little relaxation as Mr Hunter did, for he ſeldom ſlept above four hours in the night, but always an hour after dinner. In private practice he was ſcrupulouſly honeſt in declaring his opinion of the caſe before him, and ready on all occaſions to confeſs his ignorance of what he did not underſtand. He ſometimes ſpoke harſhly of his cotemporaries; which did not originate from envy, but from a full conviction that ſurgery was as yet in its infancy, and he himſelf a novice in his own art.

On October the 16th 1793, when in his uſual ſtate of health, he went to St George's Hoſpital, and meeting with ſome things which irritated his mind, and not being perfectly maſter of the circumſtances, he withheld his ſentiments; in which ſtate of reſtraint he went into the next room, and turning round to Dr Robertſon, one of the phyſicians of the hoſpital, he gave a deep groan and dropt down dead, being then in his 65th year, the ſame age at which his brother Dr Hunter had died.

HUNTING, the exerciſe or diverſion of purſuing four-footed beaſts of game. See the article GAME.

Four-footed beaſts are hunted in the fields, woods, and thickets, and that both with guns and grehounds.

Birds, on the contrary, are either ſhot in the air, or taken with nets and other devices, which exerciſe is called *fowling;* or are they are purſued and taken by birds of prey, which is called *hawking*. See the articles FOWLING, HAWKING, FALCONRY, SHOOTING, *BIRD-Catching*, and DECOY.

F. de Launay, profeſſor of the French laws, has an expreſs treatiſe of hunting. From thoſe words of God to Adam, Gen. i. 26, and 28. and to Noah, Gen. ix. 2, 3. hunting was conſidered as a right devolved or made over to man; and the following ages appear to have been of the ſame ſentiment. Accordingly we find, that among the more civilized nations it made one of their diverſions; and as to the wilder and more barbarous, it ſerved them with food and neceſſaries. The Roman juriſprudence, which was formed on the manners of the firſt ages, made a law of it, and eſtabliſhed it as a maxim, that as the natural right of things which have no maſter belongs to the firſt poſſeſſor, wild beaſts, birds, and fiſhes, are the property of whomſoever can take them firſt.

But the northern nations of barbarians who overran the Roman empire, bringing with them a ſtronger taſte for the diverſion, and the people being now poſſeſſed of other and more eaſy means of ſubſiſtence from the lands and poſſeſſions of thoſe they had vanquiſhed, their chiefs and leaders began to appropriate the right of hunting, and, inſtead of a natural right, to make it a royal one. Thus it continues to this day; the right of hunting, among us, belonging only to the king, and thoſe who derive it from him.

The hunting uſed by the ancients was much like that now practiſed for the rein-deer; which is ſeldom hunted at force, or with hounds; but only drawn with a blood-hound, and foreſtalled with nets and engines. Thus did they with all beaſts; whence a dog is never commended by them for opening before he has diſcovered where the beaſt lies. Hence, they were not in any manner curious as to the muſic of their hounds, or the compoſition of their kennel or pack, either for deepneſs,

deepneſs, loudneſs, or ſweetneſs of cry, which is a principal point in the hunting of our days. Their huntſmen, indeed, were accuſtomed to ſhout and make a great noiſe, as Virgil obſerves in the third of his Georgics: *Ingentem clamore premes ad retia cervum.* But that confuſion was only to bring the deer to the nets laid for him.

The Sicilian way of hunting had ſomething in it very extraordinary.—The nobles or gentry being informed which way a herd of deer paſſed, gave notice to one another, and appointed a meeting; every one bringing with him a croſs-bow or long-bow, and a bundle of ſtaves ſhod with iron, the heads bored, with a cord paſſing through them all: thus provided, they came to the herd, and, caſting themſelves about in a large ring, ſurrounded the deer.—Then, each taking his ſtand, unbound his faggot, ſet up his ſtake, and tied the end of the cord to that of his next neighbour, at the diſtance of ten feet from one another.—Then taking feathers, died in crimſon, and faſtened on a thread, they tied them to the cord; ſo that with the leaſt breath of wind they would whirl round.—Which done, the perſons who kept the ſtands withdrew, and hid themſelves in the next covert. Then the chief ranger entering within the line with hounds to draw after the herd, rouſed the game with their cry; which flying towards the line, were turned off, and, ſtill gazing on the ſhaking and ſhining feathers, wandered about as if kept in with a real wall or pale. The ranger ſtill purſued, and calling every perſon by name as he paſſed by their ſtand, commanded him to ſhoot the firſt, third, or ſixth, as he pleaſed: and if any of them miſſed, or ſingled out another than that aſſigned him, it was counted a grievous diſgrace. By ſuch means, as they paſſed by the ſeveral ſtations, the whole herd was killed by the ſeveral hands. *Pier. Hieroglyphic.* lib. vii. cap. 6.

Hunting formed the greateſt part of the employment of the ancient Germans, and probably of the Britons alſo, when they were not engaged in war. We are informed by ſome ancient hiſtorians, that this was the caſe even as late as the third century with the unconquered Britons who lived beyond Adrian's wall; nay, that they ſubſiſted chiefly by the prey they took in this way. The great attachment ſhown by all the Celtic nations to hunting, however, proceeded moſt probably from its being a kind of apprenticeſhip to war. Thus their youth acquired that courage, ſtrength, ſwiftneſs, and dexterity in handling their arms, which made them ſo formidable in time of war to their enemies. Thus alſo they freed the country from many miſchievous animals which abounded in the foreſts, furniſhing themſelves alſo with materials for thoſe feaſts which ſeem to have conſtituted their greateſt pleaſure. The young chieftains had thus likewiſe an opportunity of paying court to their miſtreſſes, by diſplaying their bravery and agility, and making them preſents of their game; nay, ſo ſtrong and univerſal was the paſſion for hunting among the ancient Britons, that young ladies of the higheſt quality and greateſt beauty ſpent much of their time in the chace. They employed much the ſame weapons in hunting that they did in war, viz. long ſpears, javelins, and bows and arrows; having alſo great numbers of dogs to aſſiſt them in finding and purſuing their game. Theſe dogs, we are alſo told, were much admired among other nations, on account of their ſwiftneſs, ſtrength, fierceneſs, and exquiſite ſenſe of ſmelling. They were of ſeveral different kinds, called by different names, and formed a conſiderable article of commerce. They were highly valued by all the Celtic nations, inſomuch that ſome very comical penalties were inflicted upon thoſe who were convicted of ſtealing them (A). From the poems of Oſſian alſo it appears, that the Britons were not unacquainted with the art of catching birds with hawks trained for that purpoſe; but they ſeem to have been abſolutely ignorant of the method of catching fiſh; for there is not a ſingle alluſion to this art in all the works of that venerable bard. Their ignorance of this art is both confirmed and accounted for by Dio Niceus, who aſſures us, that the ancient Britons never taſted fiſh, though they had innumerable multitudes in their ſeas, rivers, and lakes. "By the by (ſays Dr Henry), we may obſerve that this agreement between the poems of Oſſian and the Greek hiſtorian, in a circumſtance ſo ſingular, is at once a proof of the genuine antiquity of theſe poems, and that the Greek and Roman writers were not ſo ill informed about the affairs and manners of the ancient Britons as ſome have imagined."

The Mexicans, whatever imbecility may be imputed to them in other reſpects, were very dexterous in hunting. They uſed bows and arrows, darts, nets, ſnares, and a kind of tubes named *carbottane*, through which they ſhot by blowing out little balls at birds. Thoſe which the kings and great men made uſe of were curiouſly carved and painted, and likewiſe adorned with gold and ſilver. Beſides the exerciſe of the chace which private individuals took either for amuſement or to provide food for themſelves, there were general hunting-matches, ſometimes appointed by the king; at others, undertaken with a view to provide plenty of victims for ſacrifices. A large wood, generally that of Zacatapec, not far diſtant from the capital, was pitched upon as the ſcene of theſe grand hunting-matches. Here they choſe the place beſt adapted for ſetting a great number of ſnares and nets. The wood was incloſed by ſome thouſands of hunters, forming a circle of ſix, ſeven, or eight miles, according to the number of animals they intended to take. Fire was then ſet to the graſs in a great number of places, and a terrible noiſe made with drums, horns, ſhouting, and whiſtling. The hunters gradually contracted their circle, continuing the noiſe till the game were incloſed in a very ſmall ſpace. They were then killed or taken in ſnares, or with the hands of the hunters. The number of animals taken or deſtroyed on theſe occaſions was ſo great, that the firſt Spaniſh viceroy of Mexico would not believe it without making the experiment himſelf. The place choſen for his hunting-match was a great plain in the country of the

(A) Si quis canem veltraum aut ſegutium vel petrunculum, præſumſerit involare, jubemus ut convictus, coram omni populo, poſteriora ipſius oſculetur.

the Otomies, lying between the villages of Xilotepec and S. Giovani del Rio; the Indians being ordered to proceed according to their usual customs in the times of their paganism. The viceroy, attended by a vast retinue of Spaniards, repaired to the place appointed, where accommodations were prepared for them in houses of wood erected for the purpose. A circle of more than 15 miles was formed by 11,000 Otomies, who started such a quantity of game on the plain, that the viceroy was quite astonished, and commanded the greater part of them to be set at liberty, which was accordingly done. The number retained, however, was still incredibly great, were it not attested by a witness of the highest credit. On this occasion upwards of 600 deer and wild goats, 100 cajotes, with a surprising number of hares, rabbits, and other smaller animals. The plain still retains the Spanish name *Cazadero*, which signifies the "place of the chace."

The Mexicans, besides the usual methods of the chace, had particular contrivances for catching certain animals. Thus, to catch young asses, they made a small fire in the woods, putting among the burning coals a particular kind of stone named *cacalotl*, "raven or black stone," which bursts with a loud noise when heated. The fire was covered with earth, and a little maize laid around it. The asses quickly assembled with their young, in order to feed upon the maize; but while they were thus employed, the stone burst, and scared away the old ones by the explosion, while the young ones, unable to fly, where carried off by the hunters. Serpents were taken even by the hands, seizing them intrepidly by the neck with one hand, and sewing up their mouths with the other. This method is still practised. They showed the greatest dexterity in tracing the steps of wild beasts, even when an European could not have discerned the smallest print of their feet. The Indian method, however, was by observing sometimes the herbs or leaves broken down by their feet; sometimes the drops of blood which fell from them when wounded. It is said that some of the American Indians show still greater dexterity in discovering the tracts of their enemies, which to an European would be altogether imperceptible.

Hunting was a favourite diversion of the great and bloody conqueror Jenghiz Khan, if indeed we can apply the word *diversion* to a monster whose mind was set upon the destruction of his own species, and who only endeavoured to make the murder of brutes subservient to that of men, by keeping his soldiers in a kind of warfare with the beasts when they had no human enemies to contend with. His expeditions were conducted on a plan similar to that of the Mexicans already mentioned; and were no doubt attended with still greater success, as his numerous army could inclose a much greater space than all the Indians whom the Spanish viceroy could muster. The East Indian princes still show the same inclination to the chace; and Mr Blane, who attended the hunting excursions of Asoph Ul Dowlah visir of the Mogul empire and nabob of Oude in 1785 and 1786, gives the following account of the method practised on this occasion.

The time chosen for the hunting party is about the beginning of December; and the diversion is continued till the heats, which commence about the beginning of March, oblige them to stop. During this time a circuit of between 400 and 600 miles is generally made; the hunters bending their course towards the skirts of the northern mountains, where the country is wild and uncultivated. The visir takes along with him not only his court and seraglio, but a great part of the inhabitants of his capital. His immediate attendants may amount to about 2000; but besides these he is also followed by 500 or 600 horse, and several battalions of regular sepoys with their field-pieces. Four or five hundred elephants are also carried along with him: of which some are used for riding, others for fighting, and some for clearing the jungles and forests of the game. About as many sumpter horses of the beautiful Persian and Arabian breeds are carried along with him. A great many wheel carriages drawn by bullocks likewise attend, which are used chiefly for the convenience of the women; sometimes also he has an English chaise or two, and sometimes a chariot; but all these as well as the horses are merely for show, the visir himself never using any other conveyance than an elephant, or sometimes when fatigued or indisposed a palanquin. The animals used in the sport are principally gre-hounds, of which there may be about 300; he has also about 200 hawks, and a few trained leopards for hunting deer. There are a great number of marksmen, whose profession it is to shoot deer; with many fowlers, who provide game: as none of the natives of India know how to shoot game with small shot, or to hunt with slow hounds. A vast number of matchlocks are carried along with the company, with many English pieces of various kinds, 40 or 50 pairs of pistols, bows and arrows, besides swords, daggers, and sabres without number. There are also nets of various kinds, some for quail, and others very large, for fishing, which are carried along with him upon elephants, attended by fishermen, so as always to be ready for throwing into any river or lake that may be met with. Every article that can contribute to luxury or pleasure is likewise carried along with the army. A great many carts are loaded with the Ganges water, and even ice is transported for cooling the drink. The fruits of the season and fresh vegetables are daily sent to him from his gardens by bearers stationed at the distance of every ten miles; by which means each article is conveyed day or night at the rate of four miles an hour. Besides the animals already mentioned, there are also fighting antelopes, buffaloes, and rams in great numbers; also several hundred pigeons, some fighting cocks, with a vast variety of parrots, nightingales, &c.

To complete the magnificence or extravagance of this expedition, there is always a large bazar, or moving town, which attends the camp; consisting of shopkeepers and artificers of all kinds, money-changers, dancing-women; so that, on the most moderate calculation, the whole number of people in his camp cannot be computed at fewer than 20,000. The nabob himself, and all the gentlemen of his camp, are provided with double sets of tents and equipage, which are always sent on the day before to the place to which he intends to go; and this is generally eight or ten miles in whatever direction most game is expected; so that by the time he has finished his sport in the morning, he finds his whole camp ready pitched for his reception.

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The nabob, with the attending gentlemen, proceed in a regular moving court or durbar, and thus they keep converfing together and looking out for game. A great many foxes, hares, jackals, and fometimes deer, are picked up by the dogs as they pafs along: the hawks are carried immediately before the elephants, and let fly at whatever game is fprung for them, which is generally partridges, buftards, quails, and different kinds of herons; thefe laft affording excellent fport with the falcons or fharp-winged hawks. Wild boars are fometimes ftarted, and either fhot or run down by the dogs and horfemen. Hunting the tyger, however, is looked upon as the principal diverfion, and the difcovery of one of thefe animals is accounted a matter of great joy. The cover in which the tyger is found is commonly long grafs, or reeds of fuch a height as frequently to reach above the elephants; and it is difficult to find him in fuch a place, as he commonly endeavours either to fteal off, or lies fo clofe to the ground that he cannot be roufed till the elephants are almoft upon him. He then roars and fkulks away, but is fhot at as foon as he can be feen; it being generally contrived that the nabob fhall have the compliment of firing firft. If he be not difabled, the tyger continues to fkulk along, followed by the line of elephants; the nabob and others fhooting at him as often as he can be feen till he falls. The elephants themfelves are very much afraid of this terrible animal, and difcover their apprehenfions by fhrieking and roaring as foon as they begin to fmell him or hear him growl; generally attempting to turn away from the place where he is. When the tyger can be traced to a particular fpot, the elephants are difpofed of in a circle round him; in which cafe he will at laft make a defperate attack, fpringing upon the elephant that is neareft, and attempting to tear him with his teeth or claws. Some, but very few, of the elephants, can be brought to attack the tyger; and this they do by curling up their trunks under their mouths, and then attempting to tofs, or otherwife deftroy him with their tufks, or to crufh him with their feet or knees. It is confidered as good fport to kill one tyger in a day; though fometimes, when a female is met with her young ones, two or three will be killed.

The other objects of purfuit in thefe excurfions are wild elephants, buffaloes, and rhinocerofes. Our author was prefent at the hunting of a wild elephant of vaft fize and ftrength. An attempt was firft made to take him alive by furrounding him with tame elephants, while he was kept at bay by crackers and other fire-works; but he conftantly eluded every effort of this kind. Sometimes the drivers of the tame elephants got fo near him, that they threw ftrong ropes over his head, and endeavoured to detain him by faftening them around trees; but he conftantly fnapped the ropes like pack-threads, and purfued his way to the foreft. Some of the ftrongeft and moft furious of the fighting elephants were then brought up to engage him; but he attacked them with fuch fury that they were all obliged to defift. In his ftruggle with one of them he broke one of his tufks, and the broken piece, which was upwards of two inches in diameter, of folid ivory, flew up into the air feveral yards above their heads. Orders were now given to kill him, as it appeared impoffible to take him alive; but even this was not accomplifhed without the greateft difficulty. He twice turned and attacked the party who purfued him; and in one of thefe attacks ftruck the elephant obliquely on which the prince rode, threw him upon his fide, but then paffed on without offering farther injury. At laft he fell dead, after having received as was fuppofed upwards of 1000 balls into his body.

Notwithftanding the general paffion among moft nations for hunting, however, it has by many been deemed an exercife inconfiftent with the principles of humanity. The late king of Pruffia expreffed himfelf on this fubject in the following manner. "The chace is one of the moft fenfual of pleafures, by which the powers of the body are ftrongly exerted, but thofe of the mind remain unemployed. It is an exercife which makes the limbs ftrong, active, and pliable: but leaves the head without improvement. It confifts in a violent defire in the purfuit, and the indulgence of a cruel pleafure in the death, of the game. I am convinced that man is more cruel and favage than any beaft of prey: We exercife the dominion given us over thefe our fellow-creatures in the moft tyrannical manner. If we pretend to any fuperiority over the beafts, it ought certainly to confift in reafon; but we commonly find that the moft paffionate lovers of the chace renounce this privilege, and converfe only with their dogs, horfes, and other irrational animals. This renders them wild and unfeeling; and it is probable that they cannot be very merciful to the human fpecies. For a man who can in cold blood torture a poor innocent animal, cannot feel much compaffion for the diftreffes of his own fpecies. And, befides, can the chace be a proper employment for a thinking mind?"

The arguments ufed by his majefty againft hunting feem indeed to be much confirmed by confidering the various nations who have moft addicted themfelves to it. Thefe, as muft be feen from what has already been faid, were all barbarous; and it is remarkable, that Nimrod, the firft great hunter of whom we have any account, was likewife the firft who oppreffed and enflaved his own fpecies. As nations advanced in civilization, it always became neceffary to reftrain by law the inclination of the people for hunting. This was done by the wife legiflator Solon, left the Athenians fhould neglect the mechanic arts on its account. The Lacedemonians, on the contrary, indulged themfelves in this diverfion without controul; but they were barbarians, and moft cruelly oppreffed thofe whom they had in their power, as is evident from their treatment of the Helots. The like may be faid of the Egyptians, Perfians, and Scythians; all of whom delighted in war, and oppreffed their own fpecies. The Romans, on the other hand, who were fomewhat more civilized, were lefs addicted to hunting. Even they, however, were exceedingly barbarous, and found it neceffary to make death and flaughter familiar to their citizens from their infancy. Hence their diverfions of the amphitheatre and circus, where the hunting of wild beafts was fhown in the moft magnificent and cruel manner; not to mention their ftill more cruel fport of gladiators, &c.

In two cafes only does it feem poffible to reconcile the practice of hunting with humanity; viz. either when an uncultivated country is overrun with noxious animals; or when it is neceffary to kill wild animals for

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for food. In the former case, the noxious animals are killed because they themselves would do so if they were allowed to live; but if we kill even a lion or a tyger merely for the pleasure of killing him, we are undoubtedly chargeable with cruelty. In like manner, our modern foxhunters expresly kill foxes, not in order to destroy the breed of these noxious animals, but for the pleasure of seeing them exert all their power and cunning to save their lives, and then beholding them torn in pieces after being half dead with fatigue. This refinement in cruelty, it seems, is their favourite diversion; and it is accounted a crime for any person to destroy these animals in self-defence, as appears from the following passage in Mr Beckford's treatise on hunting. "Besides the digging of foxes, by which method many young ones are taken and old ones destroyed, traps, &c. are too often fatal to them. Farmers for their lambs (which, by the bye, few foxes ever kill), gentlemen for their game, and old women for their poultry, are their inveterate enemies. In the country where I live, most of the gentlemen are sportsmen; and even those who are not, show every kind of attention to those who are. I am sorry it is otherwise with you; and that your old gouty neighbour should destroy your foxes, I must own concerns me. I know some gentlemen, who, when a neighbour had destroyed all their foxes, and thereby prevented them from pursuing a favourite amusement, loaded a cart with spaniels, and went all together and destroyed his pheasants. I think they might have called this very properly *lex talionis*: and it had the desired effect; for as the gentleman did not think it prudent to fight them all, he took the wiser method, he made peace with them. He gave an order that no more foxes should be destroyed, and they never afterwards killed any of his pheasants."

In the first volume of the Manchester Transactions we have a dissertation upon the diversions of hunting, shooting, &c. as compatible with the principles of humanity. One argument used by the author is, that death is no positive evil to brutes. "It would perhaps (says he) be too hasty an assertion to affirm, that death to brutes is no evil. We are not competent to determine whether their existence, like our own, may not extend to some future mode of being, or whether the present limited sphere is all in which they are interested. On so speculative a question little can be advanced with precision; nor is it necessary for the investigation of the subject before us. If we may be allowed to reason from what we know, it may be safely conjectured, that death to brutes is no positive evil: we have no reason to believe they are endowed with foresight; and therefore, even admitting that with them the pleasures of life exceed its pains and cares, in terminating their existence, they only suffer a privation of pleasure."

On this extraordinary piece of reasoning we may observe, that it would hold much more against the human species than against the brutes. There are few amongst us willing to allow that the pleasures we enjoy are equivalent to our pains and cares: death therefore must be to us a relief from pain and misery, while to the brutes it is a privation of pleasure. Hence, if it be no positive evil for a brute to suffer death, to a man it must be a positive good: add to which, that a man lives in hope of an endless and glorious life, while a brute has no such hope; so that, if to kill a brute, on our author's principles, be no cruelty, to kill a man must be an act of tenderness and mercy!

Another argument, no less inconclusive, is our author's supposing that death from disease is much more to be dreaded in a brute than a violent death. Were brutes naturally in as helpless a state as man, no doubt their want of support from society in cases where they are attacked by sickness would be very deplorable; but it must be considered that the parallel betwixt the two species is in this respect by no means fair. A brute has everywhere its food at hand, and is naturally capable of resisting the inclemencies of the weather; but man has not only a natural inability to procure food for himself in the way that the brutes do, but is, besides, very tender and incapable of resisting the inclemency of the air. Hence, a man unassisted by society must very soon perish; and, no doubt, it would be much more merciful for people to kill one another at once, than to deprive them of the benefits of society, as is too frequently done in various ways needless to be mentioned at present. A brute, however, has nothing to fear. As long as its stomach can receive food, nature offers an abundant supply. One that feeds upon grass has it always within reach; and a carnivorous one will content itself with worms or insects, which, as long as it is able to crawl, it can still make a shift to provide; but so totally helpless is man when left to himself in a state of weakness, that many barbarous nations have looked upon the killing of their old and infirm people to be an act of mercy.

Equally unhappy is our author in his other arguments, that the quick transition from a state of perfect health to death mitigates the severity. The transition is not quick. The sportsmen estimate their diversion by the length of the chace; and during all that time the creature must be under the strongest agonies of terror; and what person of humanity is there who must not feel for an animal in this situation? All this is assented to by our author, who says, "Hard is the heart who does not commiserate the sufferer." Is not this an acknowledgment on his part, that before a person can become a thorough sportsman, he must harden his heart, and stifle those amiable sensations of compassion, which on all occasions ought to be encouraged towards every creature, unless in cases of necessity. But in the present case no necessity is or can be pretended. If a gentleman chooses to regale himself with venison of any kind, he may breed the animals for the purpose. We call Domitian cruel, because he took pleasure in catching flies, and stabbing them with a bodkin. A butcher is excluded from sitting on a jury on account of his being accustomed to sights which are deemed inhuman; but whether it is more inhuman to knock down an ox at once with an axe, or to tear him in pieces with dogs (for they would accomplish the purpose if properly trained), must be left to the sportsmen to determine.

Lastly, the great argument in favour of hunting, that it contributes to the health of the body and exhilaration of the spirits, seems equally fallacious with the rest. It cannot be proved that hunters are more healthy or long-lived

lived than other people. That exercife will contribute to the prefervation of health, as well as to the exhilaration of the mind, is undoubted; but many other kinds of exercife will do this as well as hunting. A man may ride from morning to night, and amufe himfelf with viewing and making remarks on the country through which he paffes; and furely there is no perfon will fay that this exercife will tend to impair his health or fink his fpirits. A man may amufe and exercife himfelf not only with pleafure, but profit alfo, in many different ways, and yet not accuftom himfelf to behold the death of animals with indifference. It is this that conftitutes the cruelty of hunting; becaufe we thus wilfully extinguifh in part that principle naturally implanted in our nature, which if totally eradicated would fet us not only on a level with the moft ferocious wild beafts, but perhaps confiderably below them; and it muft always be remembered, that whatever pleafure terminates in death is cruel, let us ufe as many palliatives as we pleafe to hide that cruelty from the eyes of others, or even from our own.

The gentlemen and mafters of the fport have invented a fet of terms which may be called the *hunting-language*. The principal are thofe which follow:

1. For beafts as they are in company.—They fay, a *herd* of harts, and all manner of deer. A *bey* of roes. A *founder* of fwine. A *rout* of wolves. A *richefs* of martens. A *brace* or *leafh* of bucks, foxes, or hares. A *couple* of rabbits or coneys.

2. For their lodging.—A hart is faid to *harbour*. A buck *lodges*. A roe *beds*. A hare *feats* or *forms*. A coney *fits*. A fox *kennels*. A marten *trees*. An otter *watches*. A badger *earths*. A boar *couches*.—Hence, to exprefs their diflodging, they fay, *Unharbour* the hart. *Roufe* the buck. *Start* the hare. *Bolt* the coney. *Unkennel* the fox. *Untree* the marten. *Vent* the otter. *Dig* the badger. *Rear* the boar.

3. For their noife at rutting time.—A hart *belleth*. A buck *growns* or *troats*. A roe *bellows*. A hare *beats* or *taps*. An otter *whines*. A boar *freams*. A fox *barks*. A badger *fhrieks*. A wolf *howls*. A goat *rattles*.

4. For their copulation.—A hart or buck goes to *rut*. A roe goes to *tourn*. A boar goes to *brim*. A hare or coney goes to *buck*. A fox goes to *clickitting*. A wolf goes to *match* or *make*. An otter *hunteth* for his kind.

5. For the footing and treading.—Of a hart, we fay the *flot*. Of a buck, and all fallow-deer, the *view*. Of all deer, if on the grafs and fcarce vifible, the *foiling*. Of a fox, the *print*; and of other the like vermin, the *footing*. Of an otter, the *marks*. Of a boar, the *track*. The hare when in open field, is faid to *fore*; when fhe winds about to deceive the hounds, fhe *doubles*; when fhe beats on the hard highway, and her footing comes to be perceived, fhe *pricketh*: in fnow, it is called the *trace* of the hare.

6. The tail of a hart, buck, or other deer, is called the *fingle*. That of a boar, the *wreath*. Of a fox, the *brufh* or *drag*; and the tip at the end, the *chape*. Of a wolf, the *ftern*. Of a hare and coney, the *fcut*.

7. The ordure or excrement of a hart and all deer, is called *fewmets* or *fewmifhing*. Of a hare, *crotiles* or *crotifing*. Of a boar, *leffes*. Of a fox, the *billiting*; and of other the like vermin, the *fuants*. Of an otter, the *fpraints*.

8. As to the attire of deer, or parts thereof, thofe of a ftag, if perfect, are the *bur*, the *pearls*, the little *knobs* on it, the *beam*, the *gutters*, the *antler*, the *fur-antler*, *royal*, *fur-royal*, and all at top the *croches*. Of the buck, the *bur*, *beam*, *brow-antler*, *black-antler*, *advancer*, *palm*, and *fpellers*. If the croches grow in the form of a man's hand, it is called a *palmed head*. Heads bearing not above three or four, and the croches placed aloft, all of one height, are called *crowned heads*. Heads having double croches, are called *forked heads*, becaufe the croches are planted on the top of the beam like forks.

9. They fay, a *litter* of cubs, a *neft* of rabbits, a fquirrel's *dray*.

10. The terms ufed in refpect of the dogs, &c. are as follow.—Of gre-hounds, two make a *brace*; of hounds, a *couple*. Of grehounds, three make a *leafh*; of hounds, a *couple* and *half*.—They fay, *let flip* a grehound; and, *caft off* a hound. The ftring wherein a grehound is led, is called a *leafh*; and that of a hound, a *lyome*. The grehound has his *collar*, and the hound his *couples*. We fay a *kennel* of hounds, and a *pack* of beagles.

Hunting, as practifed among us, is chiefly performed with dogs; of which we have various kinds, accommodated to the various kinds of game, as *hounds*, *gre-hounds*, *blood-hounds*, *terriers*, &c. See Canis, Hound, &c.

In the kennels or packs they generally rank them under the heads of *enterers*, *drivers*, *flyers*, *tyers*, &c.

On fome occafions, nets, fpears, and inftruments for digging the ground, are alfo required: nor is the hunting horn to be omitted.

The ufual chafes among us are, the *hart*, *buck*, *roe*, *hare*, *fox*, *badger*, and *otter*.—We fhall here give fomething of what relates to each thereof: firft premifing an explanation of fome general terms and phrafes, more immediately ufed in the progrefs of the fport itfelf; what belongs to the feveral forts of game in particular being referved for the refpective articles.

When the hounds, then, being caft off, and finding the fcent of fome game, begin to open and cry; they are faid to *challenge*. When they are too bufy ere the fcent be good, they are faid to *babble*. When too bufy where the fcent is good, to *bawl*. When they run it endwife orderly, holding in together merrily, and making it good, they are faid to be in *full cry*. When they run along without opening at all, it is called *running mute*.

When fpaniels open in the ftring, or a grehound in the courfe, they are faid to *lapfe*.

When beagles bark and cry at their prey, they are faid to *yearn*.

When the dogs hit the fcent the contrary way, they are faid to *draw amifs*.

When they take frefh fcent, and quit the former chafe for a new one, it is called *hunting change*.

When they *hunt* the game by the heel or track, they are faid to *hunt counter*.

When

When the chafe goes off, and returns again, traverfing the fame ground, it is called *hunting the foil.*

When the dogs run at a whole herd of deer, inftead of a fingle one, it is called *running riot.*

Dogs fet in readinefs where the game is expected to come by, and caft off after the other hounds are paffed, are called a *relay*. If they be caft off ere the other dogs be come up, it is called *vauntlay.*

When, finding where the chafe has been, they make a proffer to enter, but return, it is called a *blemifh.*

A leffon on the horn to encourage the hounds, is named a *call*, or a *recheat*. That blown at the death of a deer, is called the *mort*. The part belonging to the dogs of any chafe they have killed, is the *reward.* They fay, *take off* a deer's fkin; *ftrip* or *cafe* a hare, fox, and all forts of vermin; which is done by beginning at the fnout, and turning the fkin over the ears down to the tail.

Hunting is practifed in a different manner, and with different apparatus, according to the nature of the beafts which are hunted, a defcription of whom may be found under their refpective articles, *infra.*

With regard to the feafons, that for hart and buck-hunting begins a fortnight after midfummer, and lafts till Holy-rood day; that for the hind and doe, begins on Holy-rood day, and lafts till Candlemas; that for fox-hunting begins at Chriftmas, and holds till Lady-day; that for roe-hunting begins at Michaelmas, and ends at Chriftmas; hare-hunting commences at Michaelmas, and lafts till the end of February; and where the wolf and boar are hunted, the feafon for each begins at Chriftmas, the firft ending at Lady-day, and the latter at the Purification.

When the fportfmen have provided themfelves with nets, fpears, and a hunting horn to call the dogs together, and likewife with inftruments for digging the ground, the following directions will be of ufe to them in the purfuit of each fort of game.

Badger-Hunting. In doing this, you muft feek the earths and burrows where he lies, and in a clear moonfhine night go and ftop all the burrows, except one or two, and therein place fome facks, faftened with drawing ftrings, which may fhut him in as foon as he ftraineth the bag. Some ufe no more than to fet a hoop in the mouth of the fack, and fo put it into the hole; and as foon as the badger is in the fack and ftraineth it, the fack flippeth off the hoop, and follows him to the earth, fo he lies tumbling therein till he is taken. Thefe facks or bags being thus fet, caft off the hounds, beating about all the woods, coppices, hedges, and tufts, round about, for the compafs of a mile or two; and what badgers are abroad, being alarmed by the hounds, will foon betake themfelves to their burrows; and obferve, that he who is placed to watch the facks, muft ftand clofe and upon a clear wind: otherwife the badger will difcover him, and will immediately fly fome other way into his burrow. But if the hounds can encounter him before he can take his fanctuary, he will then ftand at a bay like a boar, and make good fport, grievoufly biting and clawing the dogs, for the manner of their fighting is lying on their backs, ufing both teeth and nails; and by blowing up their fkins, defend themfelves againft all bites of the dogs, and blows of the men upon their nofes. And for the better prefervation of your dogs, it is good to put broad collars about their necks made of gray fkins.

When the badger perceives the terriers to begin to yearn him in his burrow, he will ftop the hole betwixt him and the terriers, and if they ftill continue baying, he will remove his couch into another chamber or part of the burrow, and fo from one into another, barricading the way before them, as they retreat, until they can go no further. If you intend to dig the badger out of his burrow, you muft be provided with the fame tools as for digging out a fox; and befides, you fhould have a pail of water to refrefh the terriers, when they come out of the earth to take breath and cool themfelves. It will alfo be neceffary to put collars of bells about the necks of your terriers, which making a noife may caufe the badger to bolt out. The tools ufed for digging out of the badger, being troublefome to be carried on men's backs, may be brought in a cart. In digging, you muft confider the fituation of the ground, by which you may judge where the chief angles are; for elfe, inftead of advancing the work, you will hinder it. In this order you may befiege them in their holds, or caftles; and may break their platforms, parapets, cafements, and work to them with mines and countermines until you have overcome them.

Having taken a live and lufty badger, if you would make fport, carry him home in a fack and turn him out in your court-yard, or fome other inclofed place, and there let him be hunted and worried to death by your hounds.

There are the following profits and advantages which accrue, by killing this animal. Their flefh, blood, and greafe, though they are not good food, yet are very ufeful for phyficians and apothecaries for oils, ointments, falves, and powders for fhortnefs of breath, the cough of the lungs, for the ftone, fprained finews, colt-aches, &c. and the fkin being well dreffed, is very warm and good for old people who are troubled with paralytic diftembers.

Boar-Hunting. See Boar.

Buck-Hunting. Here the fame hounds and methods are ufed as in running the ftag; and, indeed, he that can hunt a hart or ftag well. will not hunt a buck ill.

In order to facilitate the chace, the game-keeper commonly felects a fat buck out of the herd, which he fhoots in order to maim him, and then he is run down by the hounds.

As to the method of hunting the buck. The company generally go out very early for the benefit of the morning. Sometimes they have a deer ready lodged; if not, the coverts are drawn till one is roufed: or fometimes in a park a deer is pitched upon, and forced from the herd, then more hounds are laid on to run the chace. If you come to be at a fault, the old ftaunch hounds are only to be relied upon till you recover him again: if he be funk, and the hounds thruft him up, it is called an *imprime*, and the company all found a recheat; when he is run down, every one ftrives to get in to prevent his being torn by the hounds, fallow deer feldom or never ftanding at bay.

He that firft gets in, cries hoo-up, to give notice that he is down, and blows a death. When the company are all come in, they paunch him, and reward the hounds, and generally the chief perfon of quality amongft them *takes fay*, that is, cuts his belly open, to fee how fat he is.

is. When this is done, every one has a chop at his neck; and the head being cut off, is ſhowed to the hounds, to encourage them to run only at a male deer, which they ſee by the horns, and to teach them to bite only at the head: then the company all ſtanding in a ring, one blows a ſingle death; which being done, all blow a double recheat, and ſo conclude the chace with a general halloo of hoo-up, and depart the field to their ſeveral homes, or to the place of meeting; and the huntſman, or ſome other, hath the deer caſt croſs the buttocks of his horſe and ſo carries him home.

Fox-Hunting makes a very pleaſant exerciſe, and is either above or below ground.

1. *Above ground.* To hunt a fox with hounds you muſt draw about groves, thickets, and buſhes near villages. When you find one, it will be neceſſary to ſtop up the earth the night before you deſign to hunt, and that about midnight; at which time he is gone out to prey: this may be done by laying two white ſticks acroſs in his way, which he will imagine to be ſome gin or trap laid for him; or elſe they may be ſtopped up with black thorns and earth mixed together.

Mr Beckford is of opinion that for fox-hunting the pack ſhould conſiſt of 25 couple. The hour moſt favourable for the diverſion is an early one; and he thinks that the hounds ſhould be at the cover at ſun-riſing. The huntſman ſhould then throw in his hounds as quickly as he can, and let the two whippers-in keep wide of him on either hand; ſo that a ſingle hound may not eſcape them; let them be attentive to his halloo, and let the ſportſmen be ready to encourage or rate as that directs. The fox ought on no account to be hallooed too ſoon, as in that caſe he would moſt certainly turn back again, and ſpoil all the ſport.—Two things our author particularly recommends, viz. the making all the hounds ſteady, and making them all draw. "Many huntſmen (ſays he) are fond of having them at their horſe's heels; but they never can get ſo well or ſo ſoon together as when they ſpread the cover; beſides, I have often known, when there have been only a few finders, that they have found their fox gone down the wind, and been heard of no more that day. Much depends upon the firſt finding of your fox; for I look upon a fox well found to be half killed. I think people are generally in too great a hurry on this occaſion. There are but few inſtances where ſportſmen are not too noiſy, and too fond of encouraging their hounds, which ſeldom do their buſineſs ſo well as when little is ſaid to them. The huntſman ought certainly to begin with his foremoſt hounds; and I ſhould wiſh him to keep as cloſe to them as he conveniently can; nor can any harm ariſe from it, unleſs he ſhould not have common ſenſe. No hounds can then ſlip down the wind and get out of his hearing; he will alſo ſee how far they carry the ſcent, a neceſſary requiſite; for without it he never can make a caſt with any certainty.—You will find it not leſs neceſſary for your huntſman to be active in preſſing his hounds forward when the ſcent is good, than to be prudent in not hurrying them beyond it when it is bad. It is his buſineſs to be ready at all times to lend them that aſſiſtance which they ſo frequently need, and which when they are firſt at a fault is then moſt critical. A fox-hound at that time will exert himſelf moſt; he afterwards cools and becomes more indifferent about his game. Thoſe huntſmen who do not get forward enough to take advantage of this eagerneſs and impetuoſity, and direct it properly, ſeldom know enough of hunting to be of much uſe to them afterwards. Though a huntſman cannot be too fond of hunting, a whipper-in eaſily may. His buſineſs will ſeldom allow him to be forward enough with the hounds to ſee much of the ſport. His only thought therefore ſhould be to keep the hounds together, and to contribute as much as he can to the killing of the fox: keeping the hounds together is the ſureſt means to make them ſteady. When left to themſelves they ſeldom refuſe any blood they can get; they become conceited; learn to tie upon the ſcent; and beſides this they frequently get a trick of hunting by themſelves, and are ſeldom good for much afterwards.

"Every country is ſoon known; and nine foxes out of ten, with the wind in the ſame quarter, will follow the ſame track. It is eaſy therefore for the whipper-in to cut ſhort, and catch the hounds again. With a high ſcent you cannot puſh on hounds too much. Screams keep the fox forward, at the ſame time that they keep the hounds together, or let in the tail-hounds: they alſo enliven the ſport; and, if diſcreetly uſed, are always of ſervice; but in cover they ſhould be given with the greateſt caution. Halloos ſeldom do any hurt when you are running up the wind, for then none but the tail-hounds can hear you: when you are running down the wind, you ſhould halloo no more than may be neceſſary to bring the tail-hounds forwards; for a hound that knows his buſineſs ſeldom wants encouragement when he is upon a ſcent.—Moſt fox-hunters wiſh to ſee their hounds run in a *good ſtyle*. I confeſs I myſelf am one of thoſe; I hate to ſee a ſtring of them; nor can I bear to ſee them creep where they can leap. A pack of harriers, if they have time, may kill a fox, but I defy them to kill him in the ſtyle in which he ought to be killed; they muſt hunt him down. If you intend to tire him out, you muſt expect to be tired alſo yourſelf; I never wiſh a chace to be leſs than one hour, or to exceed two: it is ſufficiently long if properly followed: it will ſeldom be longer unleſs there be a fault ſomewhere; either in the day, the huntſman, or the hounds.

"Changing from the hunted fox to a freſh one is as bad an accident as can happen to a pack of fox-hounds, and requires all the ingenuity and obſervation that man is capable of to guard againſt it. Could a fox-hound diſtinguiſh a hunted fox as the deer-hound does the deer that is blown, fox-hunting would then be perfect. A huntſman ſhould always liſten to his hounds while they are running in cover; he ſhould be particularly attentive to the headmoſt hounds, and he ſhould be conſtantly on his guard againſt a ſkirter; for if there be two ſcents, he muſt be wrong. Generally ſpeaking, the beſt ſcent is leaſt likely to be that of the hunted fox: and as a fox ſeldom ſuffers hounds to run up to him as long as he is able to prevent it; ſo, nine times out of ten, when foxes are hallooed early in the day, they are all freſh foxes. The hounds moſt likely to be right are the hard-running line-hunting ones; or ſuch as the huntſman knows had the lead before there aroſe any doubt of changing. With regard to the fox, if he break over an open country, it is no ſign that he is hard run; for they ſeldom at any time will do that unleſs they are a great way before the hounds. Alſo if he run up up the wind;—they feldom or never do that when they have been long hunted and grow weak; and when they run their foil, that alfo may direct him. All this requires a good ear and nice obfervation; and indeed in that confifts the chief excellence of a huntfman.

"When the hounds divide and are in two parts, the whipper-in, in ftopping, muft attend to the huntfman and wait for his halloo, before he attempts to ftop either: for want of proper management in this refpect I have known the hounds ftopped at both places, and both foxes loft. If they have many fcents, and it is quite uncertain which is the hunted fox, let him ftop thofe that are fartheft down the wind; as they can hear the others, and will reach them fooneft: in fuch a cafe there will be little ufe in ftopping thofe that are up the wind. When hounds are at a check, let every one be filent and ftand ftill. Whippers-in are frequently at this time coming on with the tail-hounds. They fhould never halloo to them when the hounds are at fault; the leaft thing does them harm at fuch a time, but a halloo more than any other. The huntfman, at a check, had better let his hounds alone; or content himfelf with holding them forward, without taking them off their nofes.—Should they be at a fault, after having made their own caft (which the huntfman fhould always firft encourage them to do), it is then his bufinefs to affift them further; but except in fome particular inftances, I never approve of their being caft as long as they are inclined to hunt. The firft caft I bid my huntfman make is generally a regular one, not choofing to rely entirely on his judgment: if that fhould not fucceed, he is then at liberty to follow his own opinion, and proceed as obfervation or genius may direct. When fuch a caft is made, I like to fee fome mark of good fenfe and meaning in it; whether down the wind, or towards fome likely cover or ftrong earth. However, as it is at beft uncertain, I always wifh to fee a regular caft before I fee a knowing one; which, as a laft refource, fhould not be called forth till it be wanted: The letting hounds alone is but a negative goodnefs in a huntfman; whereas it is true this laft fhows real genius; and to be perfect, it muft be born with him. There is a fault, however, which a knowing huntfman is too apt to commit: he will find a frefh fox, and then claim the merit of having recovered the hunted one. It is always dangerous to throw hounds into a cover to retrieve a loft fcent; and unlefs they hit him in, is not to be depended on.

"Gentlemen, when hounds are at fault, are too apt themfelves to prolong it. They fhould always ftop their horfes fome diftance behind the hounds; and if it be poffible to remain filent, this is the time to be fo. They fhould be careful not to ride before the hounds or over the fcent; nor fhould they ever meet a hound in the face unlefs with a defign to ftop him. Should you at any time be before the hounds, turn your horfe's head the way they are going, get out of their track, and let them pafs by you. In dry weather, and particularly in heathy countries, foxes will run the roads. If gentlemen at fuch times will ride clofe upon the hounds, they may drive them miles without any fcent. —High mettled fox-hounds are feldom inclined to ftop while horfes are clofe at their heels. No one fhould ever ride in a direction which if perfifted in would carry him amongft the hounds, unlefs he be at a great diftance behind them.

"The firft moment that hounds are at fault is a critical one for the fport-people, who fhould then be very attentive. Thofe who look forward may perhaps fee the fox; or the running of fheep, or the purfuit of crows, may give them fome tidings of him. Thofe who liften may fometimes take a hint which way he is gone from the chattering of a magpie; or perhaps be at a certainty from a diftant halloo: nothing that can give any intelligence at fuch a time ought to be neglected. Gentlemen are too apt to ride all together: were they to fpread more, they might fometimes be of fervice; particularly thofe who, from a knowledge of the fport, keep down the wind: it would then be difficult for either hounds or fox to efcape their obfervation.—You fhould, however, be cautious how you go to a halloo. The halloo itfelf muft in a great meafure direct you; and though it afford no certain rule, yet you may frequently guefs whether it can be depended upon or not. At the fowing-time, when boys are keeping off the birds, you will fometimes be deceived by their halloo; fo that it is beft, when you are in doubt, to fend a whipper-in to know the certainty of the matter."

Hounds ought not to be caft as long as they are able to hunt. It is a common, though not a very juft idea, that a hunted fox never ftops; but our author informs us that he has known them ftop even in wheel-ruts in the middle of a down, and get up in the middle of the hounds. The greateft danger of lofing a fox is at the firft finding him, and when he is finking; at both which times he frequently will run fhort, and the eagernefs of the hounds will frequently carry them beyond the fcent. When a fox is firft found, every one ought to keep behind the hounds till they are well fettled to the fcent; and when the hounds are catching him, our author wifhes them to be as filent as poffible; and likewife to eat him eagerly after he is caught. In fome places they have a method of *treeing* him; that is, throwing him acrofs the branch of a tree, and fuffering the hounds to bay at him for fome minutes before he is thrown among them; the intention of which is to make them more eager, and to let in the tail-hounds; during this interval alfo they recover their wind, and are apt to eat him more readily. Our author, however, advifes not to keep him too long, as he fuppofes that the hounds have not any appetite to eat him longer than while they are angry with him.

2. *Under-ground.* In cafe a fox does fo far efcape as to earth, countrymen muft be got together with fhovels, fpades, mattocks, pick-axes, &c. to dig him out, if they think the earth not too great. They make their earths as near as they can in ground that is hard to dig, as in clay, ftony ground, or amongft the roots of trees; and their earths have commonly but one hole, and that is ftraight a long way in before you come at their couch. Sometimes craftily they take poffeffion of a badger's old burrow, which hath a variety of chambers, holes, and angles.

Now to facilitate this way of hunting the fox, the huntfman muft be provided with one or two terriers to put into the earth after him, that is, to fix him into an angle; for the earth often confifts of many angles: the

Hunting. use of the terrier is to know where he lies; for as soon as he finds him, he continues baying or barking, so that which way the noise is heard that way dig to him. Your terriers must be garnished with bells hung in collars, to make the fox bolt the sooner; besides, the collars will be some small defence to the terriers.

The instruments to dig withal are these; a sharp-pointed spade, which serves to begin the trench where the ground is hardest and broader tools will not so well enter; the round hollowed spade, which is useful to dig among roots, having very sharp edges; the broad flat spade to dig withal, when the trench has been pretty well opened, and the ground softer; mattocks and pick-axes to dig in hard ground, where a spade will do but little service; the coal-rake to cleanse the hole, and to keep it from stopping up; clamps, wherewith you may take either fox or badger out alive to make sport with afterwards. And it would be very convenient to have a pail of water to refresh your terriers with, after they are come out of the earth to take breath.

Hare-Hunting. As, of all chases, the hare makes the greatest pastime, so it gives no little pleasure to see the craft of this small animal for her self-preservation. If it be rainy, the hare usually takes to the high-ways; and if she come to the side of a young grove, or spring, she seldom enters, but squats down till the hounds have over-shot her; and then she will return the very way she came, for fear of the wet and dew that hangs on the boughs. In this case, the huntsman ought to stay a hundred paces before he comes to the wood-side, by which means he will perceive whether she return as aforesaid; which if she do, he must halloo in his hounds; and call them back; and that presently, that the hounds may not think it the counter she came first.

The next thing that is to be observed, is the place where the hare sits, and upon what wind she makes her form, either upon the north or south wind: she will not willingly run into the wind, but run upon a side, or down the wind; but if she form in the water, it is a sign she is foul and measled: if you hunt such a one, have a special regard all the day to the brook-sides; for there, and near plashes, she will make all her crossings, doublings, &c.

Some hares have been so crafty, that as soon as they have heard the sound of a horn, they would instantly start out of their form, though it was at the distance of a quarter of a mile, and go and swim in some pool, and rest upon some rush bed in the midst of it; and would not stir from thence till they have heard the sound of the horn again, and then have started out again, swimming to land, and have stood up before the hounds four hours before they could kill them, swimming and using all subtilities and crossings in the water. Nay, such is the natural craft and subtility of a hare, that sometimes after she has been hunted three hours, she will start a fresh hare, and squat in the same form. Others having been hunted a considerable time, will creep under the door of a sheep-cot, and hide themselves among the sheep; or, when they have been hard hunted, will run in among a flock of sheep, and will by no means be gotten out from among them till the hounds are coupled up, and the sheep driven into their pens. Some of them (and that seems somewhat strange) will take the ground like a coney, and that is called *going to the vault.* Some hares will go up one side of the hedge, and come down the other, the thickness of the hedge being the only distance between the courses. A hare that has been sorely hunted, has got upon a quickset hedge, and run a good way upon the top thereof, and then leapt off upon the ground. And they will frequently betake themselves to furze bushes, and will leap from one to the other, whereby the hounds are frequently in default.

Having found where a hare hath relieved in some pasture or corn-field, you must then consider the season of the year, and what weather it is: for if it be in the spring-time, or summer, a hare will not then set in bushes, because they are frequently infested with pismires, snakes, and adders; but will set in corn-fields, and open places. In the winter-time, they set near towns and villages, in tufts of thorns and brambles, especially when the wind is northerly or southerly. According to the season and nature of the place where the hare is accustomed to sit, there beat with your hounds, and start her; which is much better sport than trailing of her from her relief to her form.

After the hare has been started and is on foot, then step in where you saw her pass, and halloo in your hounds, until they have all undertaken it and go on with it in full cry: then recheat to them with your horn, following fair and softly at first, making not too much noise either with horn or voice; for at the first, hounds are apt to overshoot the chace through too much heat. But when they have run the space of an hour, and you see the hounds are well in with it, and stick well upon it, then you may come in nearer with the hounds, because by that time their heat will be cooled, and they will hunt more soberly. But above all things, mark the first doubling, which must be your direction for the whole day; for all the doublings that she shall make afterwards will be like the former; and according to the policies that you shall see her use, and the place where you hunt, you must make your compasses great or little, long or short, to help the defaults, always seeking the moistest and most commodious places for the hounds to scent in.

To conclude: Those who delight in hunting the hare must rise early, lest they be deprived of the scent of her footsteps.

Hart or Stag Hunting. Gesner, speaking of hart-hunting, observes, that this wild, deceitful, and subtile beast, frequently deceives its hunter by windings and turnings. Wherefore the prudent hunter must train his dogs with words of art, that he may be able to set them on and take them off again at pleasure.

First of all, he should encompass the beast in her own layer, and so unharbour her in the view of the dogs, that so they may never lose her slot or footing. Neither must he set upon every one, either of the herd or those that wander solitary alone, or a little one; but partly by sight, and partly by their footing and fumets, make a judgment of the game, and also observe the largeness of his layer.

The huntsman, having made these discoveries in order to the chace, takes off the couplings of the dogs; and some on horseback, others on foot, follow the cry, with the greatest art, observation, and speed; remembering and intercepting him in his subtile turnings and headings;

headings; with all agility leaping hedges, gates, pales, ditches; neither fearing thorns, down hills, nor woods, but mounting a freſh horſe if the firſt tire. Follow the largeſt head of the whole herd, which muſt be ſingled out of the chace; which the dogs perceiving, muſt follow; not following any other. The dogs are animated to the ſport by the winding of horns, and the voices of the huntſmen. But ſometimes the crafty beaſt ſends forth his little ſquire to be ſacrificed to the dogs and hunters, inſtead of himſelf, lying cloſe the mean time. In this caſe, the huntſman muſt ſound a retreat, break off the dogs, and take them in, that is, leam them again, until they be brought to the fairer game; which riſeth with fear, yet ſtill ſtriveth by flight, until he be wearied and breathleſs. The nobles call the beaſt *a wiſe hart*, who, to avoid all his enemies, runneth into the greateſt herds, and ſo brings a cloud of error on the dogs, to obſtruct their further purſuit; ſometimes alſo bearing ſome of the herd into his footings, that ſo he may the more eaſily eſcape by amuſing the dogs. Afterwards he betakes himſelf to his heels again, ſtill running with the wind, not only for the ſake of refreſhment, but alſo becauſe by that means he can the more eaſily hear the voice of his purſuers whether they be far from him or near to him. But at laſt being again diſcovered by the hunters and ſagacious ſcent of the dogs, he flies into the herds of cattle, as cows, ſheep, &c. leaping on a cow or ox, laying the fore parts of his body thereon, that ſo touching the earth only with his hinder feet, he may leave a very ſmall or no ſcent at all behind for the hounds to diſcern. But their uſual manner is, when they ſee themſelves hard beſet and every way intercepted, to make force at their enemy with their horns, who firſt comes upon him, unleſs they be prevented by ſpear or ſword. When the beaſt is ſlain, the huntſman with his horn windeth the fall of the beaſt; and then the whole company comes up, blowing their horns in triumph for ſuch a conqueſt; among whom, the ſkilfulleſt opens the beaſt, and rewards the hounds with what properly belongs to them, for their future encouragement; for which purpoſe the huntſmen dip bread in the ſkin and blood of the beaſt to give to the hounds.

It is very dangerous to go in to a hart at bay; of which there are two ſorts, one on land and the other in water. Now, if the hart be in a deep water, where you cannot well come at him, then couple up your dogs; for ſhould they continue long in the water, it would endanger their ſurbating or foundering. In this caſe, get a boat, and ſwim to him, with dagger drawn, or elſe with rope that has a nooſe, and throw it over his horns: for if the water be ſo deep that the hart ſwims, there is no danger in approaching him; otherwiſe you muſt be very cautious.

As to the land-bay, if a hart be burniſhed, then you muſt conſider the place; for if it be in a plain and open place, where there is no wood nor covert, it is dangerous and difficult to come in to him; but if he be on a hedge-ſide, or in a thicket, then, while the hart is ſtaring on the hounds, you may come ſoftly and covertly behind him, and cut his throat. If you miſs your aim, and the hart turn head upon you, then take refuge at ſome tree; and when the hart is at bay, couple up your hounds; and when you ſee the hart turn head to fly, gallop in roundly to him, and kill him with your ſword.

Directions at the Death of a Hart or Buck. The firſt ceremony, when the huntſman comes in to the death of a deer, is to cry "ware haunch," that the hounds may not break into the deer; which being done, the next is the cutting his throat, and there blooding the youngeſt hounds, that they may the better love a deer, and learn to leap at his throat: then the mort having been blown, and all the company come in, the beſt perſon who hath not taken ſay before, is to take up the knife that the keeper or huntſman is to lay acroſs the belly of the deer, ſome holding by the fore legs, and the keeper or huntſman drawing down the pizzle, the perſon who takes ſay, is to draw the edge of the knife leiſurely along the middle of the belly, beginning near the briſket, and drawing a little upon it, enough in the length and depth to diſcover how fat the deer is; then he that is to break up the deer, firſt ſlits the ſkin from the cutting of the throat downwards, making the arber, that ſo the ordure may not break forth, and then he paunches him, rewarding the hounds with it.

In the next place, he is to preſent the ſame perſon who took ſay, with a drawn hanger, to cut off the head of the deer. Which being done, and the hounds rewarded, the concluding ceremony is, if it be a ſtag, to blow a triple mort; and if a buck, a double one; and then all who have horns, blow a recheat in concert, and immediately a general whoop, whoop.

Otter-Hunting is performed with dogs, and alſo with a ſort of inſtruments called *otter-ſpears;* with which when they find themſelves wounded, they make to land, and fight with the dogs, and that moſt furiouſly, as if they were ſenſible that cold water would annoy their green wounds.

There is indeed craft to be uſed in hunting them; but they may be catched in ſnares under water, and by river-ſides: but great care muſt be taken, for they bite ſorely and venomouſly; and if they happen to remain long in the ſnare, they will not fail to get themſelves free by their teeth.

In hunting them, one man muſt be on one ſide of the river, and another on the other, both beating the banks with dogs; and the beaſt not being able to endure the water long, you will ſoon diſcover if there be an otter or not in that quarter; for he muſt come out to make his ſpraints, and in the night ſometimes to feed on graſs and herbs.

If any of the hounds finds out an otter, then view the ſoft grounds and moiſt places, to find out which way he bent his head; if you cannot diſcover this by the marks, you may partly perceive it by the ſpraints; and then follow the hounds, and lodge him as a hart or deer. But if you do not find him quickly, you may imagine he is gone to couch ſomewhere farther off from the river; for ſometimes they will go to feed a conſiderable way from the place of their reſt, chooſing rather to go up the river than down it. The perſons that go a-hunting otters, muſt carry their ſpears, to watch his vents, that being the chief advantage; and if they perceive him ſwimming under water, they muſt endeavour to ſtrike him with their ſpears, and if they miſs, muſt purſue him with the hounds, which, if they be good and perfectly entered, will go chanting

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ing and trailing along by the river-fide, and will beat every root of a tree, and ofier-bed, and tuft of bulrufhes; nay, they will fometimes take water, and bait the beaft, like a fpaniel, by which means he will hardly efcape.

Roe-buck Hunting is performed divers ways, and very eafily in the woods.

When chafed, they ufually run againft the wind, becaufe the coolnefs of the air refrefhes them in their courfe; therefore the huntfmen place their dogs with the wind: they ufually, when hunted, firft take a large ring, and afterwards hunt the hounds. They are alfo often taken by counterfeiting their voice, which a fkilful huntfman knows how to do by means of a leaf in his mouth. When they are hunted, they turn much and often, and come back upon the dogs directly; and when they can no longer endure, they take foil, as the hart does, and will hang by a bough in fuch a manner, that nothing of them fhall appear above the water but their fnout, and they will fuffer the dogs to come juft upon them before they will ftir.

The venifon of a roe-buck is never out of feafon, being never fat, and therefore they are hunted at any time; only that fome favour ought to be fhown the doe while fhe is big with fawn, and afterwards till her fawn is able to fhift for himfelf; but fome roe-does have been killed with five fawns in their bellies.

He is not called, by the fkilful in the art of hunting, a *great* roe-buck, but a *fair* roe-buck; the herd of them is called a *bevy:* and if he hath not bevy-greafe upon his tail, when he is broken up, he is more fit to be dog's meat than man's meat. The hounds muft be rewarded with the bowels, the blood, and feet flit afunder, and boiled altogether; this is more properly called a *dofe* than a *reward*.

Hunting-Match. The firft thing that is to be confidered by one who defigns to match his horfe for his own advantage, and his horfe's credit, is not to flatter himfelf with the opinion of his horfe, by fancying that he is a fwift, when he is but a flow gallopper; and that he is a whole-running-horfe, that is, that he will run four miles without a fob at the height of his fpeed, when he is not able to run two or three. Very probably fome gentlemen are led into this error, by their being miftaken in the fpeed of their hounds, who for want of trying them againft other dogs that have been really fleet, have fuppofed their own to be fo, when in reality they are but of a middling fpeed; and becaufe their horfe, when trained, was able to follow them all day, and upon any hour, to command them upon deep as well as light earths, have therefore made a falfe conclufion, that their horfe is as fwift as the beft; but, upon trial againft a horfe that has been rightly trained after hounds that were truly fleet, have bought their experience perhaps full dear. Therefore it is advifable for all lovers of hunting to procure two or three couple of tried hounds, and once or twice a-week to follow after them at train-fcent; and when he is able to top them on all forts of earth, and to endure heats and colds ftoutly, then he may better rely on his fpeed and toughnefs.

That horfe which is able to perform a hare-chafe of five or fix miles brifkly and courageoufly, till his body be as it were bathed in fweat; and then, after the hare has been killed, in a nipping frofty morning, can endure to ftand till the fweat be frozen on his back, fo that he can endure to be pierced with the cold as well as the heat; and then, even in that extremity of cold, to ride another chafe as brifkly, and with as much courage as he did the former; that horfe which can thus endure heats and colds is moft valued by fportfmen. Therefore in order to make a judgment of the goodnefs of a horfe, obferve him after the death of the firft hare, if the chafe has been any thing brifk: if, when he is cold, he fhrinks up his body, and draws his legs up together, it is an infallible fign of want of vigour and courage: the like may be done by the flackening of his girths after the firft chafe, and from the dulnefs of his teeth, and the dulnefs of his countenance, all which are true tokens of faintnefs and being tired; and fuch a horfe is not to be relied on in cafe of a wager.

Here it will not be improper to take notice of the way of making matches in former times, and the modern way of deciding wagers. The old way of trial was, by running fo many train-fcents after hounds, as was agreed upon between the parties concerned, and a bell-courfe, this being found not fo uncertain, but more durable than hare-hunting; and the advantage confifted in having the trains led on earth moft fuitable to the qualifications of the horfes. But now others choofe to hunt the hare till fuch an hour, and then to run this wild-goofe chafe; a method of racing that takes its name from the manner of the flight of wild-geefe, which is generally one after another; fo the two horfes after running of twelvefcore yards, had liberty, which horfe foever could get the leading, to ride what ground he pleafed, the hindmoft horfe being bound to follow him, within a certain diftance agreed on by articles, or elfe to be whipped up by the triers or judges which rode by; and whichever horfe could diftance the other won the match.

But this chafe, in itfelf very inhuman, was foon found to be very deftructive to good horfes, efpecially when two good horfes were matched; for neither being able to diftance the other till both were ready to fink under their riders through weaknefs, oftentimes the match was fain to be drawn and left undecided, though both the horfes were quite fpoiled.

This brought up the cuftom of train-fcents, which afterwards was changed to three heats and a ftraight courfe; and that the lovers of horfes might be encouraged to keep good ones, plates have been erected in many places in Britain. The fewer of thefe before you come to the courfe, if your horfe be fiery and mettled, the better; and the fhorter the diftance, the better. Alfo, above all things, be fure to make your bargain to have the leading of the firft train; and then make choice of fuch grounds where your horfe may beft fhow his fpeed, and the fleeteft dogs you can procure: give your hounds as much law before you as your triers will allow, and then making a loofe, try to win the match with a wind: but if you fail in this attempt, then bear your horfe, and fave him for the courfe; but if your horfe be flow, but well-winded, and a true fpurred nag, then the more train-fcents you run before you come to the ftraight-courfe, the better. But here you ought to obferve to gain the leading of the firft train; which in this cafe you muft

lead

lead upon ſuch deep earths, that it may not end near any light ground: for this is the rule received among horſemen, that the next train is to begin where the laſt ends, and the laſt train is to be ended at the ſtarting place of the courſe; therefore remember to end your laſt on deep earths, as well as the firſt.

HUNTINGDON, the county-town of Huntingdonſhire in England, ſeated upon an eaſy aſcent, on the north ſide of the river Ouſe. It was made a free borough by King John, conſiſting of a mayor, 12 aldermen, burgeſſes, &c. by whom the two members of parliament are choſen. It had anciently 15 pariſhes, and has now but two; in one of which, called *St John's*, Oliver Cromwell was born, in 1599. Here was formerly a caſtle, built by William the Conqueror, which afterwards belonged to David, a prince of Scotland, with the title of *earl*; but Henry VIII. gave it to George Haſtings, with the earldom annexed, in whoſe family it ſtill continues. It ſtands on the great north road; and has a bridge built of free-ſtone over the Ouſe, which is made navigable for ſmall veſſels as high as Bedford. It is the place where the aſſizes are kept, and where the county-jail ſtands. It has a good market-place, and ſeveral convenient inns, beſides a grammar-ſchool; and is very populous. W. Long. 0. 5. N. Lat. 52. 17.

HUNTINGDONSHIRE, a county of England, bounded on the ſouth by Bedfordſhire; on the weſt by Northamptonſhire, as alſo on the north; and by Cambridgeſhire on the eaſt; extending 26 miles in length from north to ſouth, 20 in breadth from eaſt to weſt, and near 67 in circumference. This county, which is in the dioceſe of Lincoln, is divided into four hundreds, and contains 6 market-towns, 29 vicarages, 78 pariſhes, 256 villages, about 6841 houſes, and in 1801, nearly 38,000 inhabitants; but ſends only four members to parliament, namely, two knights of the ſhire, and two members for Huntingdon. It is a good corn country; and abounds in paſtures, eſpecially on the eaſtern ſide, which is fenny. The reſt is diverſified by riſing hills and ſhady groves, and the river Ouſe waters the ſouthern part.

The air of this county is in moſt parts pleaſant and wholeſome, except among the fens and meres, though they are not ſo bad as the hundreds of Kent and Eſſex. The ſoil is fruitful, and produces great crops of corn, and the hilly parts afford a fit paſture for ſheep. They have great numbers of cattle; and plenty of water-fowl, fiſh, and turf for firing; which laſt is of great ſervice to the inhabitants, there being but little wood, though the whole county was a foreſt in the time of Henry II. The only river beſides the Ouſe is the Nen, which runs through Whittleſey mere.

HU-QUANG, a province of the kingdom of China, in Aſia, which has a great river called *Yang*, and *Tſe-chiang*, which runs acroſs it from eaſt to weſt. It is divided into the north and ſouth parts, the former of which contains eight cities of the firſt rank, and 60 of the ſecond and third; and the latter, ſeven of the firſt rank, and five of the ſecond and third. It is a flat, open country, watered everywhere with brooks, lakes, and rivers, in which there are great numbers of fiſh. Here is plenty of wild-fowls; the fields nouriſh cattle without number, and the ſoil produces corn, and various kinds of fruits. There is gold found in the

ſands of the rivers; and in the mines they have iron, tin, &c. In ſhort, there is ſuch a variety of all ſorts of commodities, that it is called *the magazine of the empire*.

HURA, in *Botany*, a genus of plants belonging to the monœcia claſs; and in the natural method ranking under the 38th order, *Tricoccæ*. See BOTANY *Index*.

HURDLE, is the name of a ſledge uſed to draw traitors to the place of execution.

HURDLES, in *Fortification*, are made of twigs of willows or oſiers interwoven cloſe together, ſuſtained by long ſtakes. They are made in the figure of a long ſquare, the length being five or ſix feet, and the breadth three and a half. The cloſer they are wattled together, the better. They ſerve to render the batteries firm, or to conſolidate the paſſage over muddy ditches; or to cover traverſes and lodgments for the defence of the workmen againſt fire-works or ſtones thrown againſt them.

The Romans had a kind of military execution for mutineers, called *putting to death under the hurdle*. The manner of it was this: The criminal was laid at his length in a ſhallow water, under an hurdle, upon which was heaped ſtones, and ſo preſſed down till he was drowned.

HURDLES, in *Huſbandry*, certain frames made either of ſplit timber, or of hazel-rods wattled together, to ſerve for gates in incloſures, or to make ſheep-folds, &c.

HURDS, or HORDS, of flax or hemp; the coarſer parts ſeparated in the dreſſings from the tear, or fine ſtuff. See FLAX.

HURL-BONE, in a horſe, a bone near the middle of the buttock, very apt to go out of its ſockets with a hurt or ſtrain.

HURLERS, a number of large ſtones, ſet in a kind of ſquare figure near St Clare in Cornwall, ſo called from an odd opinion held by the common people, that they are ſo many men petrified, or changed into ſtones, for profaning the ſabbath-day by hurling the ball, an exerciſe for which the people of that country have been always famous.

The hurlers are oblong, rude, and unhewed. Many authors ſuppoſe them to have been trophies erected in memory of ſome battle: others take them for boundaries to diſtinguiſh lands. Laſtly, others, with more probability, hold them to have been ſepulchral monuments.

HURLY-BURLY, in vulgar language, denotes confuſion or tumult, and is ſaid to owe its origin to two neighbouring families, Hurleigh and Burleigh, which filled their part of the kingdom with conteſt and violence.

HURON, a vaſt lake of North America, ſituated between 84° and 89° W. Long. and between 43° and 46° of N Lat from whence the country contiguous to it is called *the country of the Hurons*, whoſe language is ſpoken over a great extent in the ſouthern parts of America.

HURRICANE, a general name for any violent ſtorm of wind; but which is commonly applied to thoſe ſtorms which happen in the warmer climates, and which greatly exceed the moſt violent ſtorms known in this country. The ruin and deſolation accompanying a hurricane (ſays Dr Moſely *) cannot be deſcribed. Like fire, its reſiſtleſs force conſumes every thing in its track, in the moſt terrible and rapid manner. It is generally preceded by an aweful ſtillneſs of the elements, and a cloſeneſs and miſtineſs in the atmoſphere, which makes the ſun appear red, and the ſtars larger. But a dreadful reverſe ſucceeding—The ſky is ſuddenly overcaſt and wild—The ſea riſes at once from a profound calm into mountains—The wind rages and roars like the noiſe of cannon—The rain deſcends in deluges—A diſmal obſcurity envelopes the earth with darkneſs—The ſuperior regions appear rent with lightning and thunder—The earth often does and always ſeems to tremble—Terror and conſternation diſtract all nature—Birds are carried from the woods into the ocean; and thoſe whoſe element is the ſea, ſeek for refuge on land—The frightened animals in the field aſſemble together, and are almoſt ſuffocated by the impetuoſity of the wind in ſearching for ſhelter; which, when found, ſerves them only for deſtruction—The roofs of houſes are carried to vaſt diſtances from their walls, which are beat to the ground, burying their inhabitants under them—Large trees are torn up by the roots, and huge branches ſhivered off, and driven through the air in every direction, with immenſe velocity—Every tree and ſhrub that withſtands the ſhock, is ſtripped of its boughs and foliage—Plants and graſs are laid flat on the earth—Luxuriant ſpring is changed in a moment to dreary winter.—This direful tragedy ended, when it happens in a town, the devaſtation is ſurveyed with accumulated horror; the harbour is covered with wrecks of boats and veſſels; and the ſhore has not a veſtige of its former ſtate remaining. Mounds of rubbiſh and rafters in one place, heaps of earth and trunks of trees in another, deep gullies from torrents of water, and the dead and dying bodies of men, women, and children, half buried, and ſcattered about, where ſtreets but a few hours before were, preſent the miſerable ſurvivors with a ſhocking concluſion of a ſpectacle to be followed by famine, and when accompanied by an earthquake by mortal diſeaſes.

* *Treatiſe on Tropical Diſeaſes*, &c. 8vo.

Theſe deſtructive phenomena are now thought to ariſe from electricity, though the manner in which it acts in this caſe is by no means known. It ſeems probable, indeed, that not only hurricanes, but even the moſt gentle gales of wind, are produced by the action of the electric fluid; for which ſee WIND, WHIRLWIND, &c. METEOROLOGY *Index*.

HURST, HYRST, or HERST, are derived from the Saxon *hyrſt*, i. e. *a wood*, or *grove of trees*. There are many places in Kent, Suſſex, and Hampſhire, which begin and end with this ſyllable; and the reaſon may be, becauſe the great wood called *Andreſwald* extended through thoſe counties.

HURST-Caſtle, a fortreſs of Hampſhire in England, not far from Limington. It is ſeated on the extreme point of a neck of land which ſhoots into the ſea, towards the iſle of Wight, from which it is diſtant two miles.

HUSBAND, a man joined or contracted with a woman in marriage. See MARRIAGE.

HUSBAND-Land, a term uſed in Scotland for a portion of land containing ſix acres of ſock and ſcythe land; that is, of land that may be tilled with a plough, and mowen with a ſcythe.

HUSBANDRY, as defined by ſome, includes not only agriculture, but ſeveral other branches connected with it, ſuch as the rearing of cattle, the management of the dairy, making butter and cheeſe, raiſing flax, timber, &c. See AGRICULTURE.

Virgilian HUSBANDRY, a term uſed by authors to expreſs that ſort of huſbandry, the precepts of which are ſo beautifully delivered in Virgil's Georgics. The huſbaundry in England is Virgilian in general, as is ſeen by the method of paring and burning the ſurface, of raftering or croſs-ploughing, and of the care in deſtroying weeds, upon the ſame principle, and by much the ſame means. In thoſe parts of England along the ſouthern coaſt, where the Romans principally inhabited, not only the practice, but the expreſſions, are in many reſpects the ſame with thoſe of the ancient Romans, many of the terms uſed by the ploughmen being of Latin origin, and the ſame with thoſe uſed by thoſe people on the like occaſions. And on a ſtrict obſervation, more of Virgil's huſbandry is at this time practiſed in England than in Italy itſelf. This change in the Italian huſbandry is, however, much more to the credit of that people, than the retaining the Virgilian ſcheme is to ours.

Tull, who has eſtabliſhed a new method of huſbandry, obſerves, that it is upon the whole ſo contradictory to this old plan, that it may be called the *anti-Virgilian huſbandry;* and adds, that no practice can be worſe than the Virgilian.

HUSK, the ſame with what botaniſts call the *calyx* or *cup* of a flower. See CALYX, BOTANY *Index*.

HUSO. See ACCIPENSER, ICHTHYOLOGY *Index*.

HUSS, JOHN. See HUSSITES.

HUSSARS, are the national cavalry of Hungary and Croatia. Their regimentals conſiſt in a rough furred cap, adorned with a cock's feather (the officers either an eagle's or a heron's); a doublet, with a pair of breeches to which the ſtockings are faſtened, and yellow or red boots: beſides, they occaſionally wear a ſhort upper waiſtcoat edged with fur, and five rows of round metal buttons; and in bad weather a cloak. Their arms are a ſabre, carbine, and piſtols. They are irregular troops: hence, before beginning an attack, they lay themſelves ſo flat on the necks of their horſes, that it is hardly poſſible to diſcern their force; but being come within piſtol-ſhot of the enemy, they raiſe themſelves with ſuch ſurpriſing quickneſs, and begin the fight with ſuch vivacity on every ſide, that, unleſs the enemy is accuſtomed to their method of engaging, it is very difficult for troops to preſerve their order. When a retreat is neceſſary, their horſes have ſo much fire, and are ſo indefatigible, their equipage ſo light, and themſelves ſuch excellent horſemen, that no other cavalry can pretend to follow them. They leap over ditches, and ſwim over rivers, with ſurpriſing facility. They never encamp, and conſequently are not burdened with any camp-equipage, ſaving a kettle and a hatchet to every ſix men. They always lie in the woods, out-houſes, or villages, in the front of the army. The emperor, queen of Hungary, and king of Pruſſia, have the greateſt number of troops under this name in their ſervice.

HUSSITES, in eccleſiaſtical hiſtory, a party of reformers, the followers of John Huſs.

John Huſs, from whom the Huſſites take their name, Hussites. name, was born in a little village in Bohemia, called *Huss*, and lived at Prague in the highest reputation, both on account of the sanctity of his manners and the purity of his doctrine. He was distinguished by his uncommon erudition and eloquence, and performed at the same time the functions of professor of divinity in the university, and of ordinary pastor in the church of that city. He adopted the sentiments of Wickliffe, and the Waldenses; and in the year 1407 began openly to oppose and preach against divers errors in doctrine, as well as corruptions in point of discipline, then reigning in the church. Huss likewise endeavoured to the utmost of his power to withdraw the university of Prague from the jurisdiction of Gregory XII. whom the kingdom of Bohemia had hitherto acknowledged as the true and lawful head of the church. This occasioned a violent quarrel between the incensed archbishop of Prague and the zealous reformer, which the latter inflamed and augmented from day to day, by his pathetic exclamations against the court of Rome, and the corruptions that prevailed among the sacerdotal order.

There were other circumstances that contributed to inflame the resentment of the clergy against him. He adopted the philosophical opinions of the realists, and vehemently opposed and even persecuted the nominalists, whose number and influence were considerable in the university of Prague. He also multiplied the number of his enemies in the year 1408, by procuring through his great credit, a sentence in favour of the Bohemians, who disputed with the Germans concerning the number of suffrages which their respective nations were intitled to in all matters that were carried by election in this university. In consequence of a decree obtained in favour of the former, which restored them to their constitutional right of three suffrages, usurped by the latter, the Germans withdrew from Prague, and, in the year 1409, founded a new academy at Leipsick. This event no sooner happened, than Huss began to inveigh with greater freedom than he had before done against the vices and corruptions of the clergy, and to recommend, in a public manner, the writings and opinions of Wickliffe, as far as they related to the papal hierarchy, the despotism of the court of Rome, and the corruption of the clergy. Hence an accusation was brought against him, in the year 1410, before the tribunal of John XXIII. by whom he was solemnly expelled from the communion of the church. Notwithstanding this sentence of excommunication, he proceeded to expose the Romish church with a fortitude and zeal that were almost universally applauded.

This eminent man, whose piety was equally sincere and fervent, though his zeal was perhaps too violent, and his prudence not always circumspect, was summoned to appear before the council of Constance. Secured, as he apprehended, from the rage of his enemies by the safe conduct granted him by the emperor Sigismund, for his journey to Constance, his residence in that place, and his return to his own country, John Huss obeyed the order of the council, and appeared before it to demonstrate his innocence, and to prove that the charge of his having deserted the church of Rome was entirely groundless. However, his enemies so far prevailed, that by the most scandalous breach of public faith, he was cast into prison, declared a heretic because he refused to plead guilty against the dictates of his conscience, in obedience to the council, and burnt alive in 1415; a punishment which he endured with unparalleled magnanimity and resignation.

Hussites || Hutcheson.

The same unhappy fate was borne by Jerome of Prague, his intimate companion, who attended the council, in order to support his persecuted friend. Jerome, indeed, was terrified into temporary submission; but he afterwards resumed his fortitude, and maintained the opinions, which he had for a while deserted through fear, in the flames in which he expired in 1416.

The disciples of Huss adhered to their master's doctrine after his death with a zeal which broke out into an open war, that was carried on with the most savage and unparalleled barbarity. John Ziska, a Bohemian knight, in 1420, put himself at the head of the Hussites, who were now become a very considerable party, and threw off the despotic yoke of Sigismund, who had treated their brethren in the most barbarous manner. Ziska was succeeded by Procopius, in the year 1424. The acts of barbarity that were committed on both sides were shocking and horrible beyond expression: for notwithstanding the irreconcileable opposition between the religious sentiments of the contending parties, they both agreed in this one horrible principle, that it was innocent and lawful to persecute and extirpate with fire and sword the enemies of the true religion; and such they reciprocally appeared to each other. Those commotions in a greater measure subsided, by the interference of the council of Basil, in the year 1433.

The Hussites, who were divided into two parties, viz. the Calixtines and Taborites, spread over all Bohemia and Hungary, and even Silesia and Poland; and there are some remains of them still subsisting in all those parts.

HUSTINGS (from the Saxon word *hustinge*, i. e. *concilium*, or *curia*), a court held in Guildhall before the lord-mayor and aldermen of London, and reckoned the supreme court of the city. Here deeds may be inrolled, outlawries sued out, and replevins and writs of error determined. In this court also is the election of aldermen, of the four members of parliament for the city, &c. This court is very ancient, as appears by the laws of Edward the Confessor. Some other cities have likewise had a court bearing the same name, as Winchester, York, &c.

HUSUM, a town of Denmark, in the duchy of Sleswick, and capital of a bailiwick of the same name, with a strong citadel, and a very handsome church. It is seated near the river Ow, on the German sea; and is subject to the dukes of Holstein-Gottorp. E. Long. 9. 4. N. Lat. 54. 5.

HUTCHESON, Dr Francis, a very elegant writer and excellent philosopher, was the son of a dissenting minister in the north of Ireland, and was born on the 8th of August 1694. He early discovered a superior capacity; and having gone through a school-education, began his course of philosophy at an academy, whence he removed to the university of Glasgow, where he applied himself to all the parts of literature, in which his progress was suitable to his uncommon abilities.

Hutcheson.

He then returned to Ireland: and entering into the ministry, was just about to be settled in a small congregation of dissenters in the north of Ireland, when some gentlemen about Dublin, who knew his great abilities and virtues, invited him to take up a private academy there. He complied with the invitation, and met with much success. He had been fixed but a short time in Dublin, when his singular merits and accomplishments made him generally known; and his acquaintance was sought by men of all ranks, who had any taste for literature, or any regard for learned men. Lord Viscount Molesworth is said to have taken great pleasure in his conversation, and to have assisted him with his criticisms and observations upon his "Inquiry into the Ideas of Beauty and Virtue," before it came abroad. He received the same favour from Dr Synge, lord bishop of Elphin, with whom he also lived in great friendship. The first edition of this performance came abroad without the author's name, but the merit of it would not suffer him to be long concealed. Such was the reputation of the work, and the ideas it had raised of the author, that Lord Granville, who was then lord lieutenant of Ireland, sent his private secretary to inquire at the bookseller's for the author; and when he could not learn his name, he left a letter to be conveyed to him: in consequence of which he soon became acquainted with his excellency, and was treated by him, all the time he continued in his government, with distinguished marks of familiarity and esteem.

From this time his acquaintance began to be still more courted by men of distinction either for station or literature in Ireland. Archbishop King, the author of the celebrated book *De origine mali*, held him in great esteem; and the friendship of that prelate was of great use to him in screening him from two different attempts made to prosecute him for daring to take upon him the education of youth, without having qualified himself by subscribing the ecclesiastical canons, and obtaining a licence from the bishop. He had also a large share in the esteem of the primate Bolter, who through his influence made a donation to the university of Glasgow of a yearly fund for an exhibitioner to be bred to any of the learned professions. A few years after his Inquiry into the Ideas of Beauty and Virtue, his Treatise on the Passions was published: both these works have been often reprinted; and always admired, both for the sentiment and language, even by those who have not assented to the philosophy of them, nor allowed it have any foundation in nature. About this time he wrote some philosophical papers accounting for laughter, in a different way from Hobbes, and more honourable to human nature: which papers were published in the collection called *Hibernicus's Letters*.

After he had taught in a private academy at Dublin for seven or eight years with great reputation and success, he was called, in the year 1729, to Scotland, to be a professor of philosophy in the university of Glasgow. Several young gentlemen came along with him from the academy, and his high reputation drew many more thither both from England and Ireland. Here he spent the remainder of his life in a manner highly honourable to himself and ornamental to the university of which he was a member. His whole time was divided between his studies and the duties of his office; except what he allotted to friendship and society. A firm constitution and a pretty uniform state of good health, except some few slight attacks of the gout, seemed to promise a longer life; yet he did not exceed the 53d year of his age. He was married, soon after his settlement in Dublin, to Mrs Mary Wilson, a gentleman's daughter in the county of Longford; by whom he left behind him one son, Francis Hutcheson, doctor of medicine. By this gentleman was published, from the original manuscript of his father, "A system of Moral Philosophy, in three books, by Francis Hutcheson, LL. D. at Glasgow, 1755," in two volumes, 4to.

Hutchinson, Hutton.

HUTCHINSON, John, a philosophical writer, whose notions have made no inconsiderable noise in the world, was born in 1674. He served the duke of Somerset in the capacity of steward; and in the course of his travels from place to place employed himself in collecting fossils: we are told, that the large and noble collection bequeathed by Dr Woodward to the university of Cambridge was actually made by him, and even unfairly obtained from him. When he left the duke's service to indulge his studies with more freedom, the duke, then master of the horse to George I. made him his riding surveyor, a kind of sinecure place of 200l. a year with a good house in the Meuse. In 1724 he published the first part of *Moses's Principia*, in which he ridiculed Dr Woodward's Natural History of the Earth, and exploded the doctrine of gravitation established in Newton's *Principia:* in 1727, he published a second part of *Moses's Principia*, containing the principles of the Scripture Philosophy. From this time to his death, he published a volume every year or two, which, with the MSS. he left behind, were published in 1748, in 12 vols 8vo. On the Monday before his death, Dr Mead urged him to be bled; saying pleasantly, "I will soon send you to Moses," meaning to his studies: but Mr Hutchinson taking it in the literal sense, answered in a muttering tone, "I believe, Doctor, you will;" and was so displeased, that he dismissed him for another physician; but died in a few days after, August 28. 1737. Singular as his notions are, they are not without some defenders, who have obtained the appellation of *Hutchinsonians*. The reader may find a distinct and comprehensive account of the Hutchinsonian system in a book intitled, *Thoughts concerning Religion*, &c. printed at Edinburgh 1743; and in a letter to a bishop, annexed to it, first printed in 1732.

HUTTON, Dr James, physician and naturalist, was the son of Mr William Hutton, a respectable merchant in Edinburgh. He was born on the 3d of June 1726, and lost his father while he was very young, the charge of his education devolving on his mother, who determined that it should be very liberal. Having finished his grammar-school education at the high school of Edinburgh, he entered the university at the age of 14 in the year 1740. He always considered himself as greatly indebted to Professor Stevenson's lectures on logic, not because they made him a logician, but because they accidentally gave him a predilection for chemistry which he retained and cherished to the close of life. As an illustration of some particular doctrine, the professor observed, that while the acids can singly dissolve the

the baser metals, they must unite their strength before they can have any influence upon gold; that metal is only to be dissolved by nitro-muriatic acid, formerly denominated *aqua regia*. From this remark he found his thirst for chemical knowledge daily increase, and sought for information from every quarter.

He always evinced talents sufficient to encourage the prosecution of his studies; but it was the wish of his friends that he should turn his attention to business, with which he complied though contrary to his own inclinations. In 1743 he was put an apprentice to Mr George Chalmers, writer to the signet, where he soon discovered the ruling propensity of his mind; for when he should have been transcribing law papers, he was amusing his fellow apprentices with experiments in chemistry. Mr Chalmers perceiving this, generously freed him from his obligations to serve him, desiring him to turn his attention to some other employment more congenial to his views. He fixed his choice on the study of medicine as nearly related to his favourite pursuits, and after spending about three years at Edinburgh, he studied two years at Paris, and returning home by the Low Countries, took his degree of doctor of medicine at Leyden, in September 1749. The subject of his thesis was, *De Sanguine et Circulatione in Microcosmo*.

When he arrived in London, about the end of 1749, he conceived the design of settling in the world. He justly conjectured that Edinburgh did not hold out for him any flattering prospects in the capacity of a physician, as the principal practice was in the hands of a few eminent physicians who had been long established. He accordingly wrote to his friends in Edinburgh with much anxiety, as to the subject of his future prospects in life. To Mr James Davie, a young man nearly of his own age, with whom he contracted a friendship which death only could extinguish, he also communicated the perplexed state of his mind. Their mutual knowledge of the nature of sal ammoniac led them to establish this manufacture, which afterwards became a most lucrative concern to both. The sentiments of Mr Davie were communicated to Dr Hutton while yet in London, which probably was the chief reason why he resolved to abandon entirely the practice of physic.

On his return to Edinburgh, in the year 1750, he resolved to devote all his attention to agriculture, which might probably be occasioned by his having succeeded to a small property in Berwickshire on the death of his father. Mr Playfair of the university of Edinburgh has ascribed it, and we apprehend with great propriety, to the native simplicity of his character, and the moderation of his views, which were always free from ambition. His attachment to the life of a farmer was increased by his acquaintance with Sir John Hall of Dunglass, a gentleman who was very ingenious, a friend and lover of science, and one who well understood agriculture. Determined to make himself master of rural economy, Dr Hutton went into the county of Norfolk, where he continued for some time in the house of a farmer, who was at once his preceptor and his host. The farmer's name was John Dybold, whose practical knowledge of agriculture Dr Hutton always mentioned in terms of the highest respect.

During his residence in this county, which was to him a paradise, he made frequent excursions into different parts of England; and although information respecting rural economy was the great and primary object of his pursuit, yet it was here that he first commenced the study of mineralogy, to serve him as an amusement on the road. He acquainted his friend Sir John Hall, that he was become remarkably fond of studying the surface of the earth, and was narrowly examining every pit, or ditch, or bed of a river that fell in his way. The agricultural knowledge he acquired in Norfolk increased his desire to pay a visit to Flanders, the only place in Europe where husbandry can boast of the greatest antiquity. He set out accordingly in the spring of 1754, and returned to England during the summer of the same year. Soon after his arrival in London, he observed in a letter to Sir John Hall; "had I doubted of it before I set out, I should have returned fully convinced that they are good husbandmen in Norfolk."

About this time he returned to his native country, and was for some time at a loss what place to fix upon for the purpose of carrying into effect his agricultural improvements. His own farm at length became his choice, and a ploughman whom he had brought with him from Norfolk gave the first specimen of excellent tillage ever exhibited in that part of Scotland. To Dr Hutton the country is indebted for the introduction of the new husbandry into a county where it may be said to have made more astonishing progress than in almost any other part of the British empire. In the year 1764, he made an excursion into the north of Scotland, in company with Commissioner Clerk, who was afterwards Sir George Clerk, a man of singular worth and abilities. They went by Crieff, Dalwhinnie, Fort Augustus, and Inverness, and returned along the coast by Aberdeen to Edinburgh. To increase his knowledge of geology was Dr Hutton's chief aim in this tour, to which he was now determined to pay the most unremitting attention. About the year 1768 he devoted his whole time to scientific pursuits, and having met with a favourable opportunity of letting his farm to advantage, he took up his constant residence in Edinburgh. He now turned his attention very much to the study of chemistry, and we believe he was the first who discovered that mineral alkali is contained in zeolite. The same fact has since been confirmed by the experiments of that celebrated mineralogist M. Klaproth, as well as by those of Dr Kennedy, which have led to others of a similar nature.

Dr Hutton gave the world his first publication in 1777, which was a small pamphlet of 37 pages, entitled, *Considerations on the nature, quality, and distinctions of Coal and Culm*. It was designed to answer a question which began to be much agitated, whether the small coal of Scotland is the same with the culm of England? and whether it ought to be carried coastwise free of all duty? This created a keen contest between the proprietors and revenue officers, the one insisting that it should, and the other that it should not pay any duty. It was discussed before the board of customs in Scotland, and even occupied the attention of the privy council. The small coal of Scotland was finally exempted from the payment of duty, to which the pamphlet of Dr Hutton greatly contributed.

During a period of 30 years the attention of the doctor was turned towards geological studies, to qualify him

him for writing on his favourite topic, a new theory of the earth. Long before that theory made its appearance in the world, he had completed the great outline of it, which was only ſhewn to a few confidential friends. He was firſt induced to publiſh it by communicating an abridgement of it to the Royal Society of Edinburgh. Of the merits or defects of this theory (for an account of which, ſee GEOLOGY), our readers muſt judge for themſelves. It has found a very able advocate in Profeſſor Playfair of the univerſity of Edinburgh, whoſe illuſtrations of it have received a very candid and ingenious reply from an anonymous writer, who entitles his book, *A comparative view of the Huttonian and Neptunean ſyſtems of geology*. Dr Hutton's theory did not meet with that reception from the public which the doctor's admirers expected, and which it is probable he looked for himſelf. Profeſſor Playfair thinks it was in a great meaſure owing to the obſcurity with which he wrote, ſo repugnant to the perſpicuity of his converſation; but as the world had received ſo many unſatisfactory theories before, it is not improbable that men were become diſguſted with every thing of the kind, and almoſt determined to refuſe a hearing to every ſubſequent attempt.

A theory of rain from the ſame author appeared in the firſt volume of the Edinburgh Tranſactions. He had made meteorology his ſtudy for a conſiderable time; and his theory has been pronounced one of the few to be met with in that department of knowledge which is deſerving of the name. Soon after this publication, Dr Hutton gave the world, in three volumes quarto, *An inveſtigation of the principles of knowledge, and of the progreſs of reaſon from ſenſe to ſcience and philoſophy*. His elements of agriculture, the reſult of much ſtudy and long experience, was the laſt work which he ſeemed anxious to publiſh, but it was left in manuſcript at his death, which took place in 1796-7. On the 26th of March he was ſeized with a ſhivering, which induced him to ſend for his friend Mr Ruſſel, who attended him as ſurgeon; but before it was poſſible for that gentleman to arrive, all medical aid was abſolutely vain. Having with ſome difficulty ſtretched out his hand to Mr Ruſſel, he inſtantly expired.

To the name of a philoſopher Dr Hutton was moſt juſtly entitled, by virtue of his natural talents, acquiſitions, and temper. The direction of his ſtudies was rather uncommon and irregular; but for that very reaſon it was peculiarly fitted to develope his quick penetration and originality of thought, by which his intellectual character was ſtrikingly marked. The vaſt acquiſitions of wealth and fortune never excited more lively ſenſations of pleaſure in the minds of men, than thoſe which aroſe in the mind of Dr Hutton on hearing of a new invention, or the being made acquainted with a new truth. This pleaſure, which appeared almoſt ridiculous to thoſe who could not enter into his views, was not confined to any one branch of ſcience; for in the language of Profeſſor Playfair, "he would rejoice over Watt's improvements on the ſteam engine, or Cook's diſcoveries in the South ſea, with all the warmth of a man who was to ſhare in the honour or the profit about to accrue from them." Dr Hutton was not excluſively attached to the company of men of letters, whoſe converſation was entirely directed to ſubjects of literature; for he could occaſionally unbend himſelf, and enjoy the innocent hilarity of promiſcuous company, when he freely indulged in the gratification of his native pleaſantry.

Dr Hutton was never married, but kept houſe with his three ſiſters, who were ornaments to their ſex, and had the ſole management of his domeſtic concerns. One of them, Miſs Iſabella, ſurvived her worthy brother, and lived to lament a death which was certainly a loſs to the literary world, as a very large ſhare of his knowledge unavoidably periſhed with himſelf. He left no particular directions behind him as to the diſpoſal of his collection of foſſils, which was accordingly preſented to Dr Black, who gave it to the Royal Society of Edinburgh, on condition that it ſhould be completely arranged, and always kept ſeparate, for the purpoſe of illuſtrating the Huttonian Theory of the Earth.

HUXING of pike, among fiſhermen, a particular method of catching that fiſh.

For this purpoſe, they take 30 or 40 as large bladders as can be got; blow them up, and tie them cloſe and ſtrong; and at the mouth of each tie a line, longer or ſhorter according to the depth of the water. At the end of the line is faſtened an armed hook, artfully baited: and thus they are put into the water with the advantage of the wind, that they may gently move up and down the pond. When a maſter pike has ſtruck himſelf, it affords great entertainment to ſee him bounce about in the water with a bladder faſtened to him; at laſt, when they perceive him almoſt ſpent, they take him up.

HUY, a town of the Netherlands, in the biſhopric of Liege, and capital of Condraſs. It is advantageouſly ſeated on the river Maeſe, over which there is a bridge. E. Long. 5. 22. N. Lat. 50. 32.

HUYGENS, CHRISTIAN, one of the greateſt mathematicians and aſtronomers of the 17th century, was the ſon of Conſtantine Huygens, lord of Zuylichem, who had ſerved three ſucceſſive princes of Orange in the quality of ſecretary; and was born at the Hague, in 1629. He diſcovered from his infancy an extraordinary fondneſs for the mathematics; in a little time made a great progreſs in them; and perfected himſelf in thoſe ſtudies under the famous profeſſor Schooten, at Leyden. In 1649, he went to Holſtein and Denmark, in the retinue of Henry count of Naſſau; and was extremely deſirous of going to Sweden, in order to ſee Des Cartes, but the count's ſhort ſtay in Denmark would not permit him. He travelled into France and England; was, in 1663, made a member of the Royal Society; and, upon his return into France, M. Colbert, being informed of his merit, ſettled a conſiderable penſion upon him to engage him to fix at Paris; to which Mr Huygens conſented, and ſtaid there from the year 1666 to 1681, where he was admitted a member of the Academy of Sciences. He loved a quiet and ſtudious manner of life, and frequently retired into the country to avoid interruption, but did not contract that moroſeneſs which is ſo frequently the effect of ſolitude and retirement. He was the firſt who diſcovered Saturn's ring, and a third ſatellite belonging to that planet, which had hitherto eſcaped the eyes of aſtronomers. He diſcovered the means of rendering clocks exact, by applying the pendulum, and rendering all its vibrations equal by the cycloid. He brought teleſcopes to perfection, made many other uſeful diſcoveries, and died at the Hague in 1695. He was

was the author of ſeveral excellent works. The principal of theſe are contained in two collections; the firſt of which was printed at Leyden in 1682, in quarto, under the title of *Opera varia;* and the ſecond at Amſterdam in 1728, in two volumes quarto, entitled *Opera reliqua.*

HUYSUM, the name of ſeveral Dutch painters; the moſt celebrated of whom was John, whoſe ſubjects were flowers, fruit, and landſcapes. According to Mr Pilkington, this illuſtrious painter hath ſurpaſſed all who have ever painted in that ſtyle; and his works excite as much ſurpriſe by their finiſhing as they excite admiration by their truth. He was born at Amſterdam in 1682, and was a diſciple of Juſtus van Huyſum his father. He ſet out in his profeſſion with a moſt commendable principle, not ſo much to paint for the acquiſition of money as of fame; and therefore he did not aim at expedition, but at delicacy, and, if poſſible, to arrive at perfection in his art. Having attentively ſtudied the pictures of Mignon, and all other artiſts of diſtinction who had painted in his own ſtyle, he tried which manner would ſooneſt lead him to imitate the lightneſs and ſingular beauties of each flower, fruit, or plant, and then fixed on a manner peculiar to himſelf, which ſeems almoſt inimitable. His pictures are finiſhed with inconceivable truth; for he painted every thing after nature; and was ſo ſingularly exact, as to watch even the hour of the day in which his model appeared in its greateſt perfection. By the judicious he was accounted to paint with greater freedom than Mignon or Breughel; with more tenderneſs and nature than Mario da Fiori, Michael Angelo di Campidoglio, or Segers; with more mellowneſs than De Heem, and greater force of colouring than Baptiſt. His reputation roſe to ſuch a height at laſt, that he fixed immoderate prices on his works; ſo that none but princes, or thoſe of princely fortunes, could pretend to become purchaſers. Six of his paintings were ſold at a public ſale in Holland for prices that were almoſt incredible. One of them, a flower-piece, for fourteen hundred and fifty guilders; a fruit-piece for a thouſand and five guilders; and the ſmaller pictures for nine hundred. The vaſt ſums which Van Huyſum received for his works, cauſed him to redouble his endeavours to excel; no perſon was admitted into his room while he was painting, not even his brothers; and his method of mixing the tints, and preſerving the luſtre of his colours, was an impenetrable ſecret, which he never would diſcloſe. Yet this conduct is certainly not to his honour, but rather an argument of a low mind, fearful of being equalled or ſurpaſſed. From the ſame principle, he would never take any diſciples, except one lady, named Haverman; and he grew envious and jealous even of her merit. By ſeveral domeſtic diſquiets his temper became changed; he grew moroſe, fretful, and apt to withdraw himſelf from ſociety. He had many enviers of his fame, which has ever been the ſevere lot of the moſt deſerving in all profeſſions; but he continued to work, and his reputation never diminiſhed. It is univerſally agreed that he has excelled all who have painted fruit and flowers before him, by the confeſſed ſuperiority of his touch, by the delicacy of his pencil, and by an amazing manner of finiſhing; nor does it appear probable that any future artiſt will become his competitor. The care which he took to purify his oils and prepare his colours, and the various experiments he made to diſcover the moſt luſtrous and durable, are inſtances of extraordinary care and induſtry as well as capacity. From having obſerved ſome of his works that were perfectly finiſhed, ſome only half finiſhed, and others only begun, the principles by which he conducted himſelf may perhaps be diſcoverable. His cloths were prepared with the greateſt care, and primed with white, with all poſſible purity, to prevent his colours from being obſcured, as he laid them on very lightly. He glazed all other colours except the clear and tranſparent, not omitting even the white ones, till he found the exact tone of the colour; and over that he finiſhed the forms, the lights, the ſhadows, and the reflections, which are all executed with preciſion and warmth, without dryneſs or negligence. The greateſt truth, united with the greateſt brilliancy, and a velvet ſoftneſs on the ſurface of his objects, are viſible in every part of his compoſitions; and as to his touch, it looks like the pencil of nature. Whenever he repreſented flowers placed in vaſes, he always painted thoſe vaſes after ſome elegant model, and the bas-relief is as exquiſitely finiſhed as any of the other parts. Through the whole he ſhows a delicate compoſition, a fine harmony, and a moſt happy effect of light and ſhadow. Thoſe pictures which he painted on a clear ground are preferred to others of his hand, as having greateſt luſtre, and as they demanded more care and exactneſs in the finiſhing; yet there are ſome on a darkiſh ground, in which appears rather more force and harmony. It is obſerved of him, that in the grouping of his flowers, he generally deſigned thoſe which were brighteſt in the centre, and gradually decreaſed the force of his colour from the centre to the extremities. The birds neſts and their eggs, the feathers, inſects, and drops of dew, are expreſſed with the utmoſt truth, ſo as even to deceive the ſpectator. And yet, after all this merited and juſt praiſe, it cannot but be confeſſed, that ſometimes his fruits appear like wax or ivory, without that peculiar ſoftneſs and warmth which is conſtantly obſervable in nature. Beſide his merit as a flower painter, he alſo painted landſcapes with great applauſe. They are well compoſed; and although he had never ſeen Rome, he adorned his ſcenes with the noble remains of ancient magnificence which are in that city. His pictures in that ſtyle are well coloured, and every tree is diſtinguiſhed by a touch that is proper for the leafing. The grounds are well broken, and diſpoſed with taſte and judgment; the figures are deſigned in the manner of Laireſſe, highly finiſhed, and touched with a great deal of ſpirit; and through the whole compoſition the ſcene repreſents Italy, in the trees, the clouds, and the ſkies. He died in 1749, aged 67.

HUZZOOR, a Hindoſtan word, ſignifying *The preſence;* applied, by way of eminence, to the Mogul's court. According to polite uſage, it is now applied to the preſence of every nabob or great man.

Huzzoor Neves; the ſecretary who reſides at court, and keeps copies of all the *firmauns*, records, or letters.

HYACINTH, in *Natural Hiſtory*, a genus of pellucid gems, whoſe colour is red with an admixture of yellow. See MINERALOGY *Index*.

HYACINTHUS, HYACINTH, a genus of plants, belonging

belonging to the hexandria claſs; and in the natural method ranking under the 10th order *Coronariæ*. See BOTANY *Index*.

HYACINTHIA, in antiquity, feaſts held at Sparta, in honour of Apollo, and in commemoration of his favourite Hyacinth.

This Hyacinth was the ſon of Amyclas king of Sparta, and was beloved both by Apollo and Zephyrus. The youth ſhowing moſt inclination to the former, his rival grew jealous; and, to be revenged, one day as Apollo was playing at the diſcus, i. e. quoits, with Hyacinth, Zephyrus turned the direction of a quoit which Apollo had pitched full upon the head of the unhappy Hyacinth, who fell down dead. Apollo then transformed him into a flower of the ſame name; and as a farther token of reſpect, they ſay, commanded this feaſt. The Hyacinthia laſted three days; the firſt and third whereof were employed in bewailing the death of Hyacinth, and the ſecond in feaſting and rejoicing.

HYADES, in *Aſtronomy*, are ſeven ſtars in the bull's head, famous among the poets for the bringing of rain. Whence their name Ὑαδης, from the Greek ὕειν "to rain." The principal of them is in the left eye, by the Arabs called *aldebaran*.

The poets feign them the daughters of Atlas and Pleone. Their brother Hyas being torn to pieces by a lioneſs, they wept his death with ſuch vehemence, that the gods, in compaſſion to them, tranſlated them into heaven, and placed them in the bull's forehead, where they continue to weep; this conſtellation being ſuppoſed to preſage rain. Others repreſent the Hyades as Bacchus's nurſes; and the ſame with the Dodonides, who fearing the reſentment of Juno, and flying from the cruelty of King Lycurgus, were tranſlated by Jupiter into heaven.

HYÆNA. See CANIS, MAMMALIA *Index*.

HYÆNIUS LAPIS, in *Natural Hiſtory*, the name of a ſtone ſaid to be found in the eyes of the hyæna. Pliny tells us, that thoſe creatures were in old times hunted and deſtroyed for the ſake of theſe ſtones, and that it was ſuppoſed they gave a man the gift of prophecy by being put under his tongue.

HYBERNACULUM, in *Botany*, WINTER-QUARTERS; defined by Linnæus to be part of the plant which defends the embryo herb from injuries during the ſeverities of the winter. See BULB and GEMMA.

HYBLA, in *Ancient Geography*, or MEGARA: which laſt name it took from the Megareans, who led thither a colony; called alſo *Hybla Parva*, and *Galeotis*. In Strabo's time Megara was extinct, but the name *Hybla* remained on account of its excellent honey named from it. It was ſituated on the eaſt coaſt of Sicily, between Syracuſe and the Leontines. *Galeotæ*, and *Megarenſes*, the names of the people, who were of a prophetic ſpirit, being the deſcendants of Galeus the ſon of Apollo. *Hyblæus* the epithet.—The *Hyblæi colles*, ſmall eminences at the ſprings of the Alabus near this place, were famous for their variety of flowers, eſpecially thyme; the honey gathered from which was by the ancients reckoned the beſt in the world, excepting that of Hymettus in Attica. By the moderns it was called *Mel Paſſi*, for the ſame reaſon, namely, on account of its excellent honey, and extraordinary fertility, till it was overwhelmed by the lava of Ætna; and having then become totally barren, its name was changed to *Mal Paſſi*. In a ſecond eruption, by a ſhower of aſhes from the mountain, it ſoon reaſſumed its ancient beauty and fertility, and for many years was called *Bel Paſſi*: and laſt of all, in the year 1669, it was again laid under an ocean of fire, and reduced to the moſt wretched ſterility; ſince which time it is again known by the appellation of *Mal Paſſi*. However, the lava, in its courſe over this beautiful country, has left ſeveral little iſlands or hillocks, juſt ſufficient to ſhow what it formerly was. Theſe make a ſingular appearance in all the bloom of the moſt luxuriant vegetation, ſurrounded and rendered almoſt inacceſſible by large fields of black and rugged lava.

HYBLA Major, in *Ancient Geography*, was ſituated in the tract lying between Mount Ætna and the river Symethus. In Pauſanias's time deſolate.

HYBLA Minor, or *Heræa*, in *Ancient Geography*, an inland town of Sicily, ſituated between the rivers Oanus and Herminius; now RAGUSA.

HYBRIDA PLANTA, a monſtrous production of two different ſpecies of plants, analogous to a mule among animals. The ſeeds of hybrid plants will not propagate.

HYBRISTICA, (of ὕβρις *injury*,) in antiquity, a ſolemn feaſt held among the Greeks, with ſacrifices and other ceremonies; at which the men attended in the apparel of women, and the women in that of men, to do honour to Venus in quality either of a god or a goddeſs, or both. Or, according to the account given by others, the hybriſtica was a feaſt celebrated at Argos, wherein the women being dreſſed like men, inſulted their huſbands, and treated them with all marks of ſuperiority, in memory of the Argian dames having anciently defended their country with ſingular courage againſt Cleomenes and Demaratus.

Plutarch ſpeaks of this feaſt in his treatiſe of the great actions of women. The name, he obſerves, ſignifies infamy; which is well accommodated to the occaſion, wherein the women ſtrutted about in men's clothes, while the men were obliged to dangle in petticoats.

HYDATIDES, in *Medicine*, little tranſparent veſicles or bladders full of water, ſometimes found ſolitary, and ſometimes in cluſters, upon the liver and various other parts, eſpecially in hydropical caſes.

HYDATOSCOPIA, called alſo HYDROMANCY, a kind of divination or method of foretelling future events by water.

HYDE, EDWARD, earl of Clarendon, and lord high-chancellor of England, was a very eminent ſtateſman and hiſtorian, ſon of Henry Hyde, a private gentleman, reſident at Dinton in Wiltſhire, where his lordſhip was born, in the month of February 1608. The firſt rudiments of his education he received in his father's houſe, the vicar of the pariſh being his preceptor, under whoſe tuition he made ſuch rapid progreſs, that he was ſent to Oxford at the age of 13, where he ſtudied only for one year in Magdalen-hall, as his father entered him in the Middle Temple, that he might be trained up to the profeſſion of the law. He repaired to London at the age of 17, being countenanced and protected by his uncle, who was afterwards chief juſtice of the court of king's bench. On the death of his uncle he was ſtill a ſtudent, yet ſuch a

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heavy misfortune did not deter him from the prosecution of his designs. As a licentiousness of manners was at that time extremely prevalent, the well-disposed part of the community considered early marriage as a commendable preservative against irregularity of conduct; and therefore in compliance with an opinion so respectable, Mr Hyde united himself in wedlock with a beautiful young lady, when he was only in the 21st year of his age, whom he had the misfortune to lose in six months after the celebration of their nuptials, she having fallen a victim to that loathsome malady the smallpox. After a widowhood of three years continuance, he married the daughter of Sir Thomas Aylesbury, with whom he lived 36 years in conjugal felicity. He considered it as a fortunate circumstance that he was made acquainted at an early period with a number of very distinguished characters, among whom we find the names of Lord Falkland, Selden, Kenelm Digby, Carew, Sheldon, May, Waller, Hales of Eton, Morley, Chillingworth, and others; of whom he has made respectable mention in memoirs written by himself; and to their instructive conversation he nobly ascribes the principal part of his literary acquisitions. His diffidence is very amiably expressed in these words; "that he never was so proud, or thought himself so good a man, as when he was the worst man in the company."

Being concerned in a cause in behalf of the merchants of London, he was thus introduced to the notice of Archbishop Laud, commissioner of the treasury, by whom he was treated with much respect, and had his advancement in the profession of the law greatly promoted. His easy circumstances and respectable connections powerfully contributed to bring him forward and increase his business as a barrister. But in the multiplicity of causes which he was employed to bring before different courts, he never lost sight of polite literature, on the study of which he bestowed indefatigable attention, and in his general deportment he exhibited more of the polished gentleman than of the mere lawyer. So great was the reputation which by this time he had acquired, that in 1640 he was chosen burgess for Wotton-Basset and Shaftesbury, in the parliament summoned by Charles I. on account of the Scotch rebellion. As public grievances first attracted the attention of this new parliament, Hyde brought forward a statement of the illegal oppressions and mal-practices of the earl marshal's court; but as it was soon dissolved, a radical investigation of the conduct of that court was for a time prevented. The borough of Saltash made choice of him for the new parliament, in which he pleaded so effectually against the earl marshal's court as to procure its suppression. He now totally abandoned the profession of a barrister, and wholly confined himself to the discussion of public business; and as he was generally supposed to be attached to no particular party, he was frequently appointed chairman of committees in the transaction of the most important affairs.

Hyde was represented to his majesty in such a favourable light, that the king requested a private interview with him, in the course of which he expressed his great obligations to him for his meritorious services, and was much pleased with his zealous attachment to the church. After this interview he may be considered as devoted to the royal cause; and in order to make a proper estimate of his subsequent conduct, it will be necessary for our readers to attend to his own declaration. He informs us that he had "a very particular passion and devotion for the person of the king; and a most zealous esteem and reverence for the constitution of government, which he believed to be so equally poised, that if the least branch of the prerogative was torn off, the subject suffered by it; and he was as much troubled when the crown exceeded its just limits." He believed the church of England to be most admirably calculated for the promotion of literature, piety, and peace, perhaps of any other in the whole world, and deemed the application of any part of its revenue to civil purposes to be the most abominable sacrilege and unpardonable robbery. He also considered the removal of bishops from the house of peers as a violation of the principles of justice, which made him an enemy to every innovation in the church from conscientious motives.

When the commons published their remonstrance on the state of the nation, Hyde drew up a reply to it, merely to gratify his own personal indignation, according to his own confession, without the smallest intention of making it public, although it is more than probable that Lord Digby was made acquainted with its contents. He was, however, at length prevailed upon to allow it to appear as the king's answer with the advice of his council. This procured him an offer of the office of solicitor-general, which he thought proper to decline, although he undertook the management of the king's affairs in parliament, in conjunction with Lord Digby and Sir John Colepepper. He opposed the king's assent to the bill for depriving the bishops of their seats in the house of peers, in which the sovereign acted in direct opposition to the sentiments of his professed friend, by giving his assent. In the year 1642 his majesty sent for Hyde to York, where he contributed his assistance in drawing up various papers in the cause of the falling monarch. He was recalled by parliament, but he refused to obey the summons without the royal permission, which excluded him from pardon by a vote of the house.

Soon after the breaking out of hostilities between the king and parliament, when the court of the former was held at Oxford, Hyde was appointed chancellor of the exchequer, sworn a member of the privy-council, and created a knight. He continued with his majesty till the month of March, 1644, when he was appointed to accompany Prince Charles to the west, and afterwards to the island of Jersey, where Sir Edward Hyde continued during two years after the departure of the prince, prosecuting his studies with indefatigable industry, and composing a history of those memorable transactions in which he himself had borne a distinguished part. He likewise published a reply to the parliamentary declaration of February 1647, in which it was declared improper to send any more addresses to the king. In 1648 he received orders to attend the prince at Paris, who having in the meantime set out for Holland, Sir Edward took shipping for Dunkirk. The prince was at the Hague when he received the melancholy intelligence of his royal father's fate. Upon this the council of the young king determined to send ambassadors to Spain, and for this purpose made choice of Sir Edward Hyde and Lord Collington, who arrived at Madrid in 1694; and when their residence in that metropolis

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tropolis was no longer neceſſary, Sir Edward returned to Paris. The king's court at the Hague was torn by diſſenſion, which made Sir Edward apply for, and obtain leave to retire to Antwerp, the reſidence of his wife and children, as he clearly perceived that his perſonal attendance was not likely to be productive of any ſubſtantial good. This retreat afforded him literary and domeſtic happineſs, and was better ſuited to the reduced ſtate of his finances. The princeſs of Orange, eldeſt daughter of the unfortunate Charles I. having aſſigned Sir Edward a houſe at Breda free of rent, out of gratitude for his warm attachment to her father, he was prevailed upon to remove to that city.

In the year 1657 he was appointed lord high-chancellor of England; a nomination which to our readers may probably ſeem ridiculous, as coming from a king who was not poſſeſſed of a kingdom; but it ſhould be remembered that the young ſovereign was of an eaſy and too pliable a diſpoſition, incapable of denying any requeſt; and therefore as applications were continually made to him for contingent grants and reverſions, he juſtly conſidered it as a prudent ſtep to raiſe a man to that high rank, who had ſufficient firmneſs to reject all improper requiſitions.

It is but doing juſtice to the memory of Sir Edward Hyde to ſay, that he was the moſt confidential and faithful miniſter of Charles II. at the time of the reſtoration; and by the conſent of all parties, the many public and private difficulties which this event occaſioned, were ſettled by him with much wiſdom, integrity and honour. Notwithſtanding he was a warm advocate for the royal prerogative, it ſays much for the wiſdom of his head and the goodneſs of his heart, that he was an enemy to the extenſion of it beyond the limits preſcribed by the conſtitution; for when it was propoſed to raiſe a great ſtanding revenue, which would have made the king independent of parliament, it met from Sir Edward the warmeſt oppoſition, and he reſtrained the zeal of the royaliſts, and their deſire of revenge. His zeal for epiſcopacy was, however, carried to an extravagant height, as it led him to wiſh for the annihilation of every veſtige of preſbyterianiſm. He was choſen chancellor of the univerſity of Oxford in 1660, and at the ſame time created a peer; being in the year following made Viſcount Cornbury and earl of Clarendon. But as his new dignity was far ſuperior to his fortune, the crown made ſeveral grants to him to enable him to ſupport it. This ſudden elevation, and the ſtrictneſs of his moral deportment, which bordered on auſterity, did not fail to create a number of enemies in ſuch a licentious court as that of Charles II.

It would perhaps be improper to omit a remarkable circumſtance reſpecting his daughter, who was a maid of honour to the princeſs of Orange, as it had every appearance of affecting his future fortune in a very material degree. The duke of York was ſo captivated with the charms of his lordſhip's daughter, that he entered with her into a private contract of marriage, when he found it impracticable to triumph over her virtue, or procure her for a miſtreſs. Finding herſelf pregnant, ſhe boldly inſiſted that the duke ſhould make an open avowal of their marriage, which rendered it neceſſary to make the king acquainted with it; but when it reached the ears of her father, he behaved on the occaſion in ſuch a manner, as greatly to tarniſh a character ſo illuſtrious. He ſaid he would rather ſee his daughter the duke's miſtreſs than his conſort; adviſed to confine her in the Tower, and even aſſerted that ſhe ought to loſe her head. He was afraid of the king's indignation, from a ſuppoſition that he was privy to the marriage, which there is no good reaſon for believing, yet ſuch an apprehenſion might bring ſuch expreſſions from him as were wholly incompatible with the feelings of a parent. His extravagant notions of royalty might alſo have their own weight in producing ſuch an unnatural conduct, ſince he would conceive the blood of majeſty to be contaminated by ſuch an alliance. To the honour of Charles he behaved on the occaſion in a very commendable manner; and notwithſtanding the rage of the queen-mother, the baſe conduct of the duke in denying his marriage, and attempting by calumny to impeach the chaſtity of his conſort, ſhe was at length acknowledged as the ducheſs of York, and became the mother of two Engliſh queens.

Earl Clarendon's influence with the crown was naturally increaſed by this marriage, while it as naturally procured him the envy of his fellow courtiers, and paved the way to his ſubſequent degradation. The ſale of Dunkirk to the French was viewed as diſhonourable by the nation at large, although perhaps on the ſcore of economy and ſound policy it was capable of vindication. To this we may add the unpopular meaſure of oppoſing the bill for granting liberty of conſcience, as it brought on him the diſpleaſure both of the king and of all religious ſectaries. Even the unfortunate war with the Dutch was charged to his account, although he was known to be its enemy from its very commencement. Rigidly virtuous himſelf, the libidinous courſe of life purſued by his maſter could not fail to give him offence, and he certainly diſpleaſed the king by the freedom of his reproofs. In defiance, therefore, of all his former ſervices, he was baſely abandoned to the indignation of the people, and driven from every office of public truſt in the month of Auguſt 1667. He was charged with the crime of high-treaſon by the houſe of commons, but the peers refuſed to commit him upon their charge; but while the diſpute between the two houſes was yet undetermined, Clarendon received his majeſty's orders to quit the kingdom. His apology to the peers was burnt by the common executioner, and a bill of baniſhment was iſſued againſt him for flying from juſtice. While he proceeded from Calais to Rouen, the court of France ſent an order to him to quit that kingdom, which bodily diſtreſs at that time rendered impracticable, upon which the cruel order was reverſed. The ſavage rage of ſome Engliſhmen nearly deprived him of his life as he paſſed from Rouen to Avignon after his recovery; but the court of France puniſhed the perpetrators of the deed. At Montpellier he met with very reſpectful treatment during a reſidence of four years, which time he devoted to the vindication of his conduct. Having ſpent ſome time at Moulins, he fixed his reſidence at Rouen, where he terminated his career in December 1674, in the 68th year of his age. His remains were brought to England, and interred in the abbey of Weſtminſter.

Lord Clarendon was the author of Contemplations and Reflections on the Pſalms; Animadverſions on a book of Mr Creſſy's in the Roman Catholic Controver-

ſy;

ly; A brief view of the Errors in Hobbes's Leviathan; Hiſtory of the grand Rebellion; his own Life and a Continuation of his Hiſtory, publiſhed by the univerſity in 1759. In a literary point of view his lordſhip is only known as an hiſtorian; and his hiſtory of the civil war is regarded by competent judges as an important ſource of information. The writings of Clarendon reſemble thoſe of a man who takes a decided part, yet his repreſentations are generally allowed to be moderate and juſt. His language is not devoid of beauty; but his injudicious uſe of the relative pronoun often renders him obſcure; few howevr have ever excelled him in the delineation of characters.

HYDE, *Dr Thomas*, profeſſor of Arabic at Oxford, and one of the moſt learned writers of the 17th century, was born in 1636; and ſtudied firſt at Cambridge, and afterwards at Oxford. Before he was 18 years of age, he was ſent from Cambridge to London to aſſiſt Mr Brian Walton in the great work of the Polyglot Bible; and about that period undertook to tranſcribe the Perſian Pentateuch out of the Hebrew characters, which Archbiſhop Uſher, who well knew the difficulty of the undertaking, pronounced to be an impoſſible taſk to a native Perſian. After he had happily ſucceeded in this, he aſſiſted in correcting ſeveral parts of Mr Walton's work, for which he was perfectly qualified. He was made archdeacon of Glouceſter, canon of Chriſt-church, head keeper of the Bodleian library, and profeſſor both of Hebrew and Arabic in the univerſity of Oxford. He was interpreter and ſecretary of the Oriental languages, during the reigns of Charles II. James II. and William III.; and was perfectly qualified to fill this poſt, as he could converſe in the languages which he underſtood. There never was an Engliſhman in his ſituation of life who made ſo great a progreſs; but his mind was ſo engroſſed by his beloved ſtudies, that he is ſaid to have been but ill qualified to appear to any advantage in common converſation. Of all his learned works (the very catalogue of which, as obſerved by Anth. Wood, is a curioſity), his *Religio Veterum Perſarum* is the moſt celebrated. Dr Gregory Sharpe, the late learned and ingenious maſter of the Temple, has collected ſeveral of his pieces formerly printed, and republiſhed them with ſome additional diſſertations, and his life prefixed, in two elegant volumes quarto. This great man died on the 18th of February 1702. Among his other works are, 1. A Latin tranſlation of Ulug Beig's obſervations on the longitude and latitude of the fixed ſtars; and 2. A catalogue of the printed books in the Bodleian library.

HYDNUM, a genus of the natural order of fungi, belonging to the cryptogamia claſs of plants. See BOTANY *Index*.

HYDRA, in fabulous hiſtory, a ſerpent in the marſh of Lerna, in Peloponneſus, repreſented by the poets with many heads, one of which being cut off, another immediately ſucceeded in its place, unleſs the wound was inſtantly cauterized. Hercules attacked this monſter; and having cauſed Iolaus to hew down wood for flaming brands, as he cut off the heads he applied the brands to the wounds, by which means he deſtroyed the hydra.

This hydra with many heads is ſaid to have been only a multitude of ſerpents, which infeſted the marſhes of Lerna near Mycene, and which ſeemed to multiply as they were deſtroyed. Hercules, with the aſſiſtance of his companions, cleared the country of them, by burning the reeds in which they lodged.

HYDRA, in *Aſtronomy*, a ſouthern conſtellation, conſiſting of a number of ſtars, imagined to repreſent a water ſerpent. The ſtars in Hydra, in Ptolemy's catalogue, are twenty-ſeven; in Tycho's, nineteen; in Hevelius's, thirty-one.

HYDRA, in *Zoology*, a genus of the order of zoophyta, belonging to the claſs of vermes. See HELMINTHOLOGY *Index*.

HYDRAGOGUES, among phyſicians, remedies which evacuate a large quantity of water in dropſies. The word is formed of ὑδωρ *water*, and αγειν *to draw* or *lead;* but the application of the term proceeds upon a miſtaken ſuppoſition, that every purgative had ſome particular humour which it would evacuate, and which could not be evacuated by any other. It is now, however, diſcovered, that all ſtrong purgatives will prove *hydragogues*, if given in large quantity, or in weak conſtitutions. The principal medicines recommended as hydragogues, are the juice of elder, the root of iris, ſoldanella, mechoacan, jalap, &c.

HYDRANGEA, a genus of plants belonging to the decandria claſs, and in the natural method ranking under the 13th order, *Succulentæ*. See BOTANY *Index*.

HYDRASTIS, a genus of plants, belonging to the polyandria claſs, and in the natural method ranking with thoſe of which the order is doubtful. See BOTANY *Index*.

HYDRARGYRUM, a name given to mercury, or quickſilver. The word is formed of ὑδωρ, *aqua*, "water," and αργυρος, *argentum*, "ſilver;" q. d. *water of ſilver*, on account of its reſembling liquid or melted ſilver.

HYDRAULICS, the ſcience of the motion of fluids, and the conſtruction of all kinds of inſtruments and machines relating thereto. See HYDRODYNAMICS.

HYDRENTEROCELE, in *Surgery*, a ſpecies of hernia, wherein the inteſtines deſcend into the ſcrotum, together with a quantity of water.

HYDROCEPHALUS, a preternatural diſtenſion of the head to an uncommon ſize by a ſtagnation and extravaſation of the lymph; which, when collected in the inſide of the cranium, is then termed *internal;* as that collected on the outſide is termed *external*. See MEDICINE *Index*.

HYDROCHARIS, the LITTLE WATER-LILY, a genus of plants belonging to the diœcia claſs, and in the natural method ranking under the firſt order, *Palmæ*. See BOTANY *Index*.

HYDROCOTYLE, WATER-NAVELWORT, a genus of plants belonging to the pentandria claſs, and in the natural method ranking under the 45th order, *Umbellatæ*. See BOTANY *Index*.

HYDRODYNAMICS.

History.

Definition.

1. HYDRODYNAMICS, from Ὑδωρ, "water", and Δυναμις, "power", is properly that ſcience which treats of the power of water, whether it acts by preſſure or by impulſe. In its more enlarged acceptation, however, it treats of the preſſure, equilibrium, coheſion, and motion of fluids, and of the machines by which water is raiſed, or in which that fluid is employed as the firſt mover. Hydrodynamics is divided into two branches, *Hydroſtatics* and *Hydraulics*. Hydroſtatics comprehends the preſſure, equilibrium, and coheſion of fluids, and Hydraulics their motion, together with the machines in which they are chiefly concerned.

HISTORY.

Hydrodynamics, in ſome reſpects, a modern ſcience.

2. The ſcience of hydrodynamics was cultivated with leſs ſucceſs among the ancients than any other branch of mechanical philoſophy. When the human mind had made conſiderable progreſs in the other departments of phyſical ſcience, the doctrine of fluids had not begun to occupy the attention of philoſophers; and, if we except a few propoſitions on the preſſure and equilibrium of water, hydrodynamics muſt be regarded as a modern ſcience, which owes its exiſtence and improvement to thoſe great men who adorned the 17th and 18th centuries.

Diſcoveries of Archimedes.

3. Thoſe general principles of hydroſtatics which are to this day employed as the foundation of that part of the ſcience, were firſt given by Archimedes in his work *De Inſidentibus Humido*, about 250 years before the birth of Chriſt, and were afterwards applied to experiments by Marinus Ghetaldus in his *Archimedes Promotus*. Archimedes maintained that each particle of a fluid maſs, when in equilibrio, is equally preſſed in every direction; and he inquired into the conditions, according to which a ſolid body floating in a fluid ſhould aſſume and preſerve a poſition of equilibrium. We are alſo indebted to the philoſopher of Syracuſe for that ingenious hydroſtatic proceſs by which the purity of the precious metals can be aſcertained, and for the ſcrew engine which goes by his name, the theory of which has lately exerciſed the ingenuity of ſome of our greateſt mathematicians.

Inventions of Cteſibius and Hero.

4. In the Greek ſchool at Alexandria which flouriſhed under the auſpices of the Ptolemies, the firſt attempts were made at the conſtruction of hydraulic machinery. About 120 years after the birth of Chriſt, the fountain of compreſſion, the ſyphon, and the forcing pump, were invented by Cteſibius and Hero; and though theſe machines operated by the elaſticity and weight of the air, yet their inventors had no diſtinct notions of theſe preliminary branches of pneumatical ſcience. The ſyphon is a ſimple inſtrument which is employed to empty veſſels full of water or ſpirituous liquors, and is of great utility in the arts. The forcing pump, on the contrary, is a complicated and abſtruſe invention, which could ſcarcely have been expected in the infancy of hydraulics. It was probably ſuggeſted to Cteſibius by the *Egyptian wheel* or *Noria*, which was common at that time, and which was a kind of chain pump, conſiſting of a number of earthen pots carried round by a wheel. In ſome of theſe machines the pots have a valve in their bottom which enables them to deſcend without much reſiſtance, and diminiſhes greatly the load upon the wheel; and if we ſuppoſe that this valve was introduced ſo early as the time of Cteſibius, it is not difficult to perceive how ſuch a machine might have led this philoſopher to the invention of the forcing pump.

Forcing pump.

Egyptian wheel.

Labours of Sextus Julius Frontinus in hydraulics.

5. Notwithſtanding theſe inventions of the Alexandrian ſchool, its attention does not ſeem to have been directed to the motion of fluids. The firſt attempt to inveſtigate this ſubject was made by Sextus Julius Frontinus, inſpector of the public fountains at Rome in the reigns of Nerva and Trajan; and we may juſtly ſuppoſe that his work entitled *De Aquæductibus urbis Romæ Commentarius* contains all the hydraulic knowledge of the ancients. After deſcribing the Roman aqueducts, and mentioning the dates of their erection, he conſiders the methods which were at that time employed for aſcertaining the quantity of water diſcharged from adjutages, and the mode of diſtributing the waters of an aqueduct or a fountain. He juſtly remarks that the expence of water from an orifice, depended not only on the magnitude of the orifice itſelf, but alſo on the height of the water in the reſervoir; and that a pipe employed to carry off a portion of water from an aqueduct, ſhould, as circumſtances required, have a poſition more or leſs inclined to the original direction of the current. But as he was unacquainted with the true law of the velocities of running water as depending upon the depth of the orifice, we can ſcarcely be surpriſed at the want of preciſion which appears in his reſults.

6. The labours of the ancients in the ſcience of hydrodynamics terminated with the life of Frontinus. The ſciences had already begun to decline, and that night of ignorance and barbariſm was advancing apace, which for more than a thouſand years brooded over the nations of Europe. During this lengthened period of mental degeneracy, when leſs abſtruſe ſtudies ceaſed to attract the notice, and rouſe the energies of men, the human mind could not be ſuppoſed capable of that vigorous exertion, and patient induſtry, which are ſo indiſpenſable in phyſical reſearches. Poetry and the fine arts, accordingly had made conſiderable progreſs under the patronage of the family of Medici, before Galileo began to extend the boundaries of ſcience. This great man, who deſerves to be called the father and reſtorer of phyſics, does not appear to have directed his attention to the doctrine of fluids: but his diſcovery of the uniform acceleration of gravity, laid the foundation of its future progreſs, and contributed in no ſmall degree to aid the exertions of genius in ſeveral branches of ſcience.

Labours of Galileo.

Of Caſtelli.

7. Caſtelli and Torricelli, two of the diſciples of Galileo, applied the diſcoveries of their maſter to the ſcience of hydrodynamics. In 1628 Caſtelli publiſhed

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a ſmall work, in which he gave a very ſatisfactory explanation of ſeveral phenomena in the motion of fluids. But he committed a great paralogiſm in ſuppoſing the velocity of the water proportional to the depth of the orifice below the ſurface of the veſſel. Toricelli obſerving that in a *jet d'eau* where the water ruſhed through a ſmall adjutage, it roſe to nearly the ſame height with the reſervoir from which it was ſupplied, imagined that it ought to move with the ſame velocity as if it had fallen through that height by the force of gravity. And hence he deduced this beautiful and important propoſition, that the velocities of fluids are as the ſquare roots of the preſſures, abſtracting from the reſiſtance of the air and the friction of the orifice. This theorem was publiſhed in 1643, in his treatiſe *De Motu Gravium naturaliter accelerato*. It was afterwards confirmed by the experiments of Raphael Magiotti, on the expence of water diſcharged from different adjutages under different preſſures; and though it is true only in ſmall orifices, it gave a new turn to the ſcience of hydraulics.

Of Toricelli.

Of Paſcal.

8. After the death of the celebrated Paſcal, who diſcovered the preſſure of the atmoſphere, a treatiſe on the equilibrium of fluids was found among his manuſcripts, and was given to the public in 1662. In the hands of Paſcal, hydroſtatics aſſumed the dignity of a ſcience. The laws of the equilibrium of fluids were demonſtrated in the moſt perſpicuous and ſimple manner, and amply confirmed by experiments. The diſcovery of Toricelli, it may be ſuppoſed, would have incited Paſcal to the ſtudy of hydraulics. But as he has not treated this ſubject in the work which has been mentioned, it was probably compoſed before that diſcovery had been made public.

Of Mariotte.

9. The theorem of Toricelli was employed by many ſucceeding writers, but particularly by the celebrated Mariotte, whoſe labours in this department of phyſics deſerve to be recorded. His *Traité du Mouvement des eaux*, which was publiſhed after his death in the year 1686, is founded on a great variety of well conducted experiments on the motion of fluids, performed at Verſailles and Chantilly. In the diſcuſſion of ſome points, he has committed conſiderable miſtakes. Others he has treated very ſuperficially, and in none of his experiments does he ſeem to have attended to the diminution of efflux ariſing from the contraction of the fluid vein, when the orifice is merely a perforation in a thin plate; but he appears to have been the firſt who attempted to aſcribe the diſcrepancy between theory and experiment to the retardation of the water's velocity ariſing from friction. His cotemporary Guglielmini, who was inſpector of the rivers and canals in the Milaneſe, had aſcribed this diminution of velocity in rivers, to tranſverſe motions ariſing from inequalities in their bottom. But as Mariotte obſerved ſimilar obſtructions, even in glaſs pipes, where no tranſverſe currents could exiſt, the cauſe aſſigned by Guglielmini ſeemed deſtitute of foundation. The French philoſopher therefore regarded theſe obſtructions as the effects of friction. He ſuppoſes that the filaments of water which graze along the ſides of the pipe loſe a portion of their velocity; that the contiguous filaments having on this account a greater velocity, rub upon the former, and ſuffer a diminution of their celerity; and that the other filaments are affected with ſimilar retardations proportional to their diſtance from the axis of the pipe. In this way the medium velocity of the current may be diminiſhed, and conſequently the quantity of water diſcharged in a given time, muſt, from the effects of friction, be conſiderably leſs than that which is computed from theory.

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The motion of rivers firſt attended to in Italy.

10. That part of the ſcience of hydrodynamics which relates to the motion of rivers ſeems to have originated in Italy. This fertile country receives from the Appennines a great number of torrents, which traverſe ſeveral principalities before they mingle their waters with thoſe of the Po, into which the greater part of them fall. To defend themſelves from the inundations with which they were threatened, it became neceſſary for the inhabitants to change the courſe of their rivers; and while they thus drove them from their own territories, they let them looſe on thoſe of their neighbours. Hence aroſe the continual quarrels which once raged between the Bologneſe, and the inhabitants of Modena and Ferrara. The attention of the Italian engineers was neceſſarily directed to this branch of ſcience; and hence a greater number of works were written on the ſubject in Italy than in all the reſt of Europe.

Theory of Guglielmini.

11. Guglielmini was the firſt who attended to the motion of water in rivers and open canals. Embracing the theorem of Toricelli, which had been confirmed by repeated experiments, Guglielmini concluded that each particle in the perpendicular ſection of a current has a tendency to move with the ſame velocity as if it iſſued from an orifice at the ſame depth from the ſurface. The conſequences deducible from this theory of running waters are in every reſpect repugnant to experience, and it is really ſurpriſing that it ſhould have been ſo haſtily adopted by ſucceeding writers. Guglielmini himſelf was ſufficiently ſenſible that his parabolic theory was contradictory to fact, and endeavoured to reconcile them by ſuppoſing the motion of rivers to be obſtructed by tranſverſe currents ariſing from irregularities in their bed. The ſolution of this difficulty as given by Mariotte was more ſatisfactory, and was afterwards adopted by Guglielmini, who maintained alſo that the viſcidity of water had a conſiderable ſhare in retarding its motion.

Diſcoveries of Sir Iſaac Newton.

12. The effects of friction and viſcidity in diminiſhing the velocity of running water were noticed in the Principia of Sir Iſaac Newton, who has thrown much light upon ſeveral branches of hydrodynamics. At a time when the Carteſian ſyſtem of vortices univerſally prevailed, this great man found it neceſſary to inveſtigate that abſurd hypotheſis, and in the courſe of his inveſtigation he has ſhewn that the velocity of any ſtratum of the vortex is an arithmetical mean between the velocities of the ſtrata which encloſed it; and from this it evidently follows, that the velocity of a filament of water moving in a pipe is an arithmetical mean between the velocities of the filaments which ſurround it. Taking advantage of theſe reſults, it was afterwards ſhewn by M. Pitot that the retardations ariſing from friction are inverſely as the diameters of the pipes in which the fluid moves. The attention of Newton was alſo directed to the diſcharge of water from orifices in the bottom of veſſels. He ſuppoſed a cylindrical veſſel full of water to be perforated in its bottom with a ſmall hole by which the water eſcaped, and the veſſel to be ſupplied with water in ſuch a manner that it always remained full at the ſame height. He then ſuppoſed this cylindrical column of water to be divided into two parts; the firſt being

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The oſcillation of waves firſt conſidered by Newton.

13. The ſubject of the oſcillation of waves, one of the moſt difficult in the ſcience of hydrodynamics, was firſt inveſtigated by Sir Iſaac Newton. By the 44th propoſition of the 2d book of his Principia, he has furniſhed us with a method of aſcertaining the velocity of the waves of the ſea, by obſerving the time in which they riſe and fall. If the two vertical branches of a ſyphon which communicate by means of a horizontal branch be filled with a fluid of known denſity, the two fluid columns when in a ſtate of reſt will be in equilibrio and their ſurfaces horizontal. But if the one column is raiſed above the level of the other, and left to itſelf, it will deſcend below that level, and raiſe the other column above it; and after a few oſcillations, they will return to a ſtate of repoſe. Newton occupied himſelf in determining the duration of theſe oſcillations, or the length of a pendulum iſochronous to their duration; and he found by a ſimple proceſs of reaſoning, that, abſtracting from the effects of friction, the length of a ſynchronous pendulum is equal to one-half of the length of the ſyphon, that is, of the two vertical branches and the horizontal one, and hence he deduced the iſochroniſm of theſe oſcillations. From this Newton concluded, that the velocity of waves formed on the ſurface of water either by the wind or by means of a ſtone, was in the ſubduplicate ratio of their ſize. When their velocity therefore is meaſured, which can be eaſily done, the ſize of the waves will be determined by taking a pendulum which oſcillates in the time that a wave takes to riſe and fall.

Labours of the Marquis Poleni.

14. In the year 1718 the Marquis Poleni publiſhed at Padua his work *De Caſtellis per quæ derivantur Fluviorum aquæ*, &c. He found from a great number of experiments, that if A be the aperture of the orifice, and D its depth below the ſurface of the reſervoir, the quantity of water diſcharged in a given time will be as $2\,AD \times \frac{0.571}{1.000}$, while it ought to be as 2 AD, if the velocity of the iſſuing fluid was equal to that acquired by falling through D. By adapting to a circular orifice through which the water eſcaped, a cylindrical tube of the ſame diameter, the marquis found that the quantity diſcharged in a determinate time was conſiderably greater than when it iſſued from the circular orifice itſelf; and this happened whether the water deſcended perpendicularly or iſſued in a horizontal direction.

Daniel Bernouilli's theory of the motion of fluids.

15. Such was the ſtate of hydrodynamics in 1738, when Daniel Bernouilli publiſhed his *Hydrodynamica, ſeu de viribus et motibus Fluidorum Commentarii*. His theory of the motion of fluids was founded on two ſuppoſitions, which appeared to him conformable to experience. He ſuppoſed that the ſurface of a fluid, contained in a veſſel which was emptying itſelf by an orifice, remains always horizontal; and if the fluid maſs is conceived to be divided into an infinite number of horizontal ſtrata of the ſame bulk, that theſe ſtrata remain contiguous to each other, and that all their points deſcend vertically, with velocities inverſely proportional to their breadth, or to the horizontal ſections of the reſervoir. In order, to determine the motion of each ſtratum, he employed the principle of the *conſervatio virium vivarum*, and obtained very elegant ſolutions. In the opinion of the abbé Boſſut, his work is one of the fineſt productions of mathematical genius.

Objected to by Maclaurin and John Bernouilli, who reſolve the problem by more direct methods.

16. The uncertainty of the principle employed by Daniel Bernouilli, which has never been demonſtrated in a general manner, deprived his reſults of that confidence which they would otherwiſe have deſerved; and rendered it deſireable to have a theory more certain, and depending ſolely on the fundamental laws of mechanics. Maclaurin and John Bernouilli, who were of this opinion, reſolved the problem by more direct methods, the one in his Fluxions, publiſhed in 1742; and the other in his *Hydraulica nunc primum detecta, et directè demonſtrata ex principiis purè mechanicis*, which forms the fourth volume of his works. The method employed by Maclaurin has been thought not ſufficiently rigorous; and that of John Bernouilli is, in the opinion of La Grange, defective in perſpicuity and preciſion.

D'Alembert applies his principle of dynamics to the motion of fluids.

17. The theory of Daniel Bernouilli was oppoſed alſo by the celebrated D'Alembert. When generaliſing James Bernouilli's Theory of Pendulums, he diſcovered a principle of dynamics ſo ſimple and general, that it reduced the laws of the motion of bodies to that of their equilibrium. He applied this principle to the motion of fluids, and gave a ſpecimen of its application at the end of his Dynamics in 1743. It was more fully developed in his *Traité des Fluides*, which was publiſhed in 1744, where he has reſolved, in the moſt ſimple and elegant manner, all the problems which relate

late to the equilibrium and motion of fluids. He makes uſe of the very ſame ſuppoſitions as Daniel Bernouilli, though his calculus is eſtabliſhed in a very different manner. He conſiders, at every inſtant, the actual motion of a ſtratum, as compoſed of a motion which it had in the preceding inſtant, and of a motion which it has loſt. The laws of equilibrium between the motions loſt, furniſh him with equations which repreſent the motion of the fluid. Although the ſcience of hydrodynamics had then made conſiderable progreſs, yet it was chiefly founded on hypotheſis. It remained a deſideratum to expreſs by equations the motion of a particle of the fluid in any aſſigned direction. Theſe equations were found by D'Alembert, from two principles, that a rectangular canal, taken in a maſs of fluid in equilibrio, is itſelf in equilibrio; and that a portion of the fluid, in paſſing from one place to another, preſerves the ſame volume when the fluid is incompreſſible, or dilates itſelf according to a given law when the fluid is elaſtic. His very ingenious method was publiſhed in 1752, in his *Eſſai ſur la reſiſtance des fluides*. It was brought to perfection in his *Opuſcules Mathematiques*, and has been adopted by the celebrated Euler.

Before the time of D'Alembert, it was the great object of philoſophers to ſubmit the motion of fluids to general formulæ, independent of all hypotheſis. Their attempts, however, were altogether fruitleſs; for the method of fluxions, which produced ſuch important changes in the phyſical ſciences, was but a feeble auxiliary in the ſcience of hydraulics. For the reſolution of the queſtions concerning the motion of fluids, we are indebted to the method of partial differences, a new calculus, with which Euler enriched the ſciences. This great diſcovery was firſt applied to the motion of water by the celebrated D'Alembert, and enabled both him and Euler to repreſent the theory of fluids in formulæ reſtrained by no particular hypotheſis.

Experiments of Michelotti.

18. An immenſe number of experiments on the motion of water in pipes and canals were made by Profeſſor Michelotti of Turin, at the expence of the ſovereign. In theſe experiments the water iſſued from holes of different ſizes, under preſſures of from five to twenty-two feet, from a tower conſtructed of the fineſt maſonry. Baſons built of maſonry, and lined with ſtucco, received the effluent water, which was conveyed in canals of brickwork, lined with ſtucco, of various forms and declivities. The whole of Michelotti's experiments were conducted with the utmoſt accuracy; and his reſults are, in every reſpect, entitled to our confidence.

Of the abbe Boſſut.

19. The experiments of the abbé Boſſut, whoſe labours in this department of ſcience have been very aſſiduous and ſucceſsful, have, in as far as they coincide, afforded the ſame reſults as thoſe of Michelotti. Though performed on a ſmaller ſcale, they are equally entitled to our confidence, and have the merit of being made in caſes which are moſt likely to occur in practice. In order to determine what were the motions of the fluid particles in the interior of a veſſel emptying itſelf by an orifice, M. Boſſut employed a glaſs cylinder, to the bottom of which different adjutages were fitted; and he found that all the particles deſcend at firſt vertically, but that at a certain diſtance from the orifice they turn from their firſt direction towards the aperture. In conſequence of theſe oblique motions, the fluid vein forms a kind of truncated conoid, whoſe greateſt baſe is the orifice itſelf, having its altitude equal to the radius of the orifice, and its baſes in the ratio of 3 to 2.—It appears alſo, from the experiments of Boſſut, that when water iſſues through an orifice made in a thin plate, the expence of water, as deduced from theory, is to the real expence as 16 to 10, or as 8 to 5; and, when the fluid iſſues through an additional tube, two or three inches long, and follows the ſides of the tube, as 16 to 13.—In analyſing the effects of friction, he found, 1. That ſmall orifices gave leſs water in proportion than great ones, on account of friction; and, 2. That when the height of the reſervoir was augmented, the contraction of the fluid vein was alſo increaſed, and the expence of water diminiſhed; and by means of theſe two laws he was enabled to determine the quantity of water diſcharged, with all the preciſion he could wiſh. In his experiments on the motion of water in canals and tubes, he found that there was a ſenſible difference between the motion of water in the former and the latter. Under the ſame height of reſervoir, the ſame quantity of water always flows in a canal, whatever be its length and declivity; whereas, in a tube, a difference in length and declivity has a very conſiderable influence on the quantity of water diſcharged.—According to the theory of the reſiſtance of fluids, the impulſe upon a plane ſurface, is as the product of its area multiplied by the ſquare of the fluid's velocity, and the ſquare of the ſine of the angle of incidence. The experiments of Boſſut, made in conjunction with D'Alembert and Condorcet, prove, that this is ſenſibly true when the impulſe is perpendicular; but that the aberrations from theory increaſe with the angle of impulſion. They found, that when the angle of impulſion was between 50° and 90°, the ordinary theory may be employed, that the reſiſtances thus found will be a little leſs than they ought to be, and the more ſo as the angles recede from 90°. The attention of Boſſut was directed to a variety of other intereſting points, which we cannot ſtop to notice, but for which, muſt refer the reader to the works of that ingenious author.

Inquiries of M. Flaugergues concerning the oſcillation of waves.

20. The oſcillation of waves, which was firſt diſcuſſed by Sir Iſaac Newton, and afterwards by D'Alembert, in the article *Ondes*, in the French Encyclopædia, was now revived by M. Flaugergues, who attempted to overthrow the opinions of theſe philoſophers. He maintained, that a wave is not the effect of a motion in the particles of water, by which they riſe and fall alternately, in a ſerpentine line, when moving from the centre where they commenced; but that it is a kind of intumeſcence, formed by a depreſſion at the place where the impulſe is firſt made, which propagates itſelf in a circular manner when removing from the point of impulſe. A portion of the water, thus elevated, he imagines, flows from all ſides into the hollow formed at the centre of impulſe, ſo that the water being, as it were, heaped up, produces another intumeſcence, which propagates itſelf as formerly. From this theory, M. Flaugergues concludes, and he has confirmed the concluſion by experiment, that all waves, whether great or ſmall, have the ſame velocity.

And of M. de la Grange.

21. This difficult ſubject has alſo been diſcuſſed by M. de la Grange, in his *Mecanique Analytique*. He found, that the velocity of waves, in a canal, is equal to that which a heavy body would acquire by falling through a height equal to half the depth of the water

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in the canal. If this depth, therefore, be one foot, the velocity of the waves will be 5.495 feet in a ſecond; and if the depth is greater or leſs than this, their velocity will vary in the ſubduplicate ratio of the depth, provided it is not very conſiderable. If we ſuppoſe that, in the formation of waves, the water is agitated but to a very ſmall depth, the theory of La Grange may be employed, whatever be the depth of the water and the figure of its bottom. This ſuppoſition, which is very plauſible, when we conſider the tenacity and adheſion of the particles of water, has alſo been confirmed by experience.

Experiments and theory of the chevalier de Buat.

22. The moſt ſucceſsful labourer in the ſcience of hydrodynamics, was the chevalier Buat, engineer in ordinary to the king of France. Following in the ſteps of the abbé Boſſut, he proſecuted the inquiries of that philoſopher with uncommon ingenuity; and in the year 1786, he publiſhed his *Principes d'Hydraulique*, which contains a ſatiſfactory theory of the motion of fluids founded ſolely upon experiments. The chevalier du Buat conſidered, that if water were a perfect fluid, and the channels in which it flowed infinitely ſmooth, its motion would be continually accelerated, like that of bodies deſcending in an inclined plane. But as the motion of rivers is not continually accelerated, and ſoon arrives at a ſtate of uniformity, it is evident that the viſcidity of the water, and the friction of the channel in which it deſcends, muſt equal the accelerating force. M. Buat, therefore, aſſumes it as a propoſition of fundamental importance, that when water flows in any channel or bed, the accelerating force, which obliges it to move, is equal to the ſum of all the reſiſtances which it meets with, whether they ariſe from its own viſcidity or from the friction of its bed. This principle was employed by M. Buat, in the firſt edition of his work, which appeared in 1779; but the theory contained in that edition was founded on the experiments of others. He ſoon ſaw, however, that a theory ſo new, and leading to reſults ſo different from the ordinary theory, ſhould be founded on new experiments more direct than the former, and he was employed in the performance of theſe from 1780 to 1783. The experiments of Boſſut having been made only on pipes of a moderate declivity, M. Buat found it neceſſary to ſupply this defect. He uſed declivities of every kind, from the ſmalleſt to the greateſt; and made his experiments upon channels, from a line and a half in diameter, to ſeven or eight ſquare toiſes. All theſe experiments he arranged under ſome circumſtances of reſemblance, and produced the following propoſition, which agrees in a moſt wonderful manner with the immenſe number of facts which he has brought together, viz. $V=\frac{307\times\sqrt{d-0.1}}{\sqrt{s}-L\sqrt{s+1.6}}-0.3\times\sqrt{d-0.1}$, where d is the hydraulic mean depth, s the ſlope of the pipe, or of the ſurface of the current, and V the velocity with which the water iſſues. The theory of M. Buat, with its application to practice, will be found in the articles RIVER and *WATER-Works*.

Reſearches of M. Venturi.

23. M. Venturi, profeſſor of natural philoſophy in the univerſity of Modena, has lately brought to light ſome curious facts reſpecting the motion of water, in his work on the "Lateral Communication of Motion in Fluids." He obſerved, that if a current of water is introduced with a certain velocity into a veſſel filled with the ſame fluid at reſt, and if this current paſſing through a portion of the fluid is received in a curvilineal channel, the bottom of which gradually riſes till it paſſes over the rim of the veſſel itſelf, it will carry along with it the fluid contained in the veſſel; ſo that after a ſhort time has elapſed, there remains only the portion of the fluid which was originally below the aperture at which the current entered. This phenomenon has been called by Venturi, the lateral communication of motion in fluids; and, by its aſſiſtance, he has explained many important facts in hydraulics. He has not attempted to explain this principle; but has ſhewn, that the mutual action of the fluid particles does not afford a ſatiſfactory explanation of it. The work of Venturi contains many other intereſting diſcuſſions, which are worthy of the attention of every reader.

Experiments of Eytelwein and others.

24. The ſcience of hydrodynamics has of late years been cultivated by M. Eytelwein of Berlin, whoſe practical concluſions coincide nearly with thoſe of Boſſut;—by Dr Matthew Young, late biſhop of Clonfert, who has explained the cauſe of the increaſed velocity of efflux through additional tubes, and by Mr Vince, Dr T. Young, Coulomb, and Don George Juan; but the limits of this work will not permit us to give any further account of their labours at preſent. We muſt now proceed to initiate the reader into the ſcience itſelf, beginning with that branch of it which relates to the preſſure, equilibrium, and coheſion of non-elaſtic fluids.

PART I. HYDROSTATICS.

Definition of hydroſtatics.

25. HYDROSTATICS is that branch of the ſcience of hydrodynamics which comprehends the preſſure and equilibrium of non-elaſtic fluids, as water, oil, mercury, &c.; the method of determining the ſpecific gravities of ſubſtances, the equilibrium of floating bodies (A), and the phenomena of capillary attraction.

Definitions and Preliminary Obſervations.

Definition of a fluid.

26. A fluid is a collection of very minute particles, cohering ſo little among themſelves, that they yield to the ſmalleſt force, and are eaſily moved among one another.

Perfect fluids.

27. Fluids have been divided into *perfect* and *imperfect*. In perfect fluids the conſtituent particles are ſuppoſed to be endowed with no coheſive force, and to be moved among one another by a preſſure infinitely ſmall.

Imperfect fluids.

But, in imperfect or viſcous fluids, the mutual coheſion of their particles is very ſenſible, as in oil, varniſh, melted glaſs, &c.; and this tenacity prevents them from yielding to the ſmalleſt preſſure. Although water, mercury, alcohol, &c. have been claſſed among perfect fluids, yet it is evident that neither theſe nor any other liquid is poſſeſſed of perfect fluidity. When a glaſs veſſel is filled with water above the brim, it aſſumes a convex ſurface; and when a quantity of it is thrown

(A) The diſcuſſion of this ſubject is reſerved as an introduction to the article *SHIP-Building*.

thrown on the floor, it is dispersed into a variety of little globules, which can scarcely be separated from one another. Even mercury, the most perfect of all the fluids, is endowed with such a cohesive force among its particles, that if a glass tube, with a small bore, is immersed in a vessel full of this fluid, the mercury will be lower in the tube than the surface of the surrounding fluid;—if a small quantity of it be put in a glass vessel, with a gentle rising in the middle of its bottom, the mercury will desert the middle, and form itself into a ring, considerably rounded at the edges; or if several drops of mercury be placed upon a piece of flat glass, they will assume a spherical form; and if brought within certain limits, they will conglobulate and form a single drop. Now, all these phenomena concur to prove, that the particles of water have a mutual attraction for each other; that the particles of mercury have a greater attraction for one another, than for the particles of glass; and, consequently, that these substances are not entitled to the appellation of perfect fluids.

28. It was universally believed, till within the last 45 years, that water, mercury, and other fluids of a similar kind, could not be made to occupy a smaller space, by the application of any external force. This opinion was founded on an experiment made by Lord Bacon, who inclosed a quantity of water in a leaden globe, and by applying a great force attempted to compress the water into less space than it occupied at first: The water, however, made its way through the pores of the metal, and stood on its surface like dew.

Florentine experiment.

The same experiment was afterwards repeated at Florence by the academy del Cimento, who filled a silver globe with water, and hammered it with such force as to alter its form, and drive the water through the pores of the metal.

Compressibility of water first noticed by Lord Bacon.

Though these experiments were generally reckoned decisive proofs of incompressibility, yet Bacon himself seems to have drawn from his experiment a very different conclusion; for after giving an account of it, he immediately adds, that *he computed into how much less space the water was driven by this violent pressure* (B). This passage from Lord Bacon does not seem to have been noticed by any writer on hydrostatics, and appears a complete proof that the compressibility of water was fairly deducible from the issue of his experiment.

Fluids divided into compressible and incompressible.

In consequence of the reliance which was universally placed on the result of the Florentine experiment, fluids have generally been divided into *compressible* and *incompressible*, or *elastic* and *non-elastic fluids*: water, oil, alcohol, and mercury, being regarded as incompressible and non-elastic; and air, steam, and other aëriform fluids, as compressible or elastic.

Compressibility of water ascertained by Mr Canton,

29. About the year 1761, the ingenious Mr Canton began to consider this subject with attention, and distrusting the result obtained by the academy del Cimento, resolved to bring the question to a decisive issue (C). Having procured a small glass tube, about two feet long, with a ball at one end, an inch and a quarter in diameter, he filled the ball and part of the tube with mercury, and brought it to the temperature of 50° of Fahrenheit. The mercury then stood six inches and a half above the ball; but after it had been raised to the top of the tube by heat, and the tube sealed hermetically, then, upon bringing the mercury to its former temperature of 50°, it stood $\frac{12}{100}$ of an inch higher in the tube than it did before. By repeating the same experiment with water exhausted of air, instead of mercury, the water stood $\frac{43}{100}$ of an inch higher in the tube than it did at first. Hence it is evident, that when the weight of the atmosphere was removed, the water and mercury expanded, and that the water expanded $\frac{11}{100}$ of an inch more than the mercury. By placing the apparatus in the receiver of a condensing engine, and condensing the air in the receiver, he increased the pressure upon the water, and found that it descended in the tube. Having thus ascertained the fact, that water and mercury are compressible, he subjected other fluids to similar experiments, and obtained the results in the following table.

	Millionth Parts.	*Specific Gravity.*
Compression of mercury	3	13.595
sea-water,	40	1.028
rain-water,	46	1.000
oil of olives,	48	0.918
spirit of wine,	66	0.846

Lest it should be imagined that this small degree of compressibility arose from air imprisoned in the water, Mr Canton made the experiment on some water which had imbibed a considerable quantity of air, and found that its compressibility was not in the least augmented. By inspecting the preceding table, it will be seen that the compressibility of the different fluids is nearly in the inverse ratio of their specific gravities.

and confirmed by Zimmerman.

30. The experiments of Mr Canton have been lately confirmed by Professor Zimmerman. He found that sea-water was compressed $\frac{1}{340}$th part of its bulk when inclosed in the cavity of a strong iron cylinder, and under the influence of a force equal to a column of sea-water 1000 feet high. From those facts, it is obvious that fluids are susceptible of contraction and dilatation, and that there is no foundation in nature for their being divided into compressible and incompressible. If fluids are compressible, they will also be elastic; for when the compressing force is removed, they will recover their former magnitude; and hence their division into elastic and non-elastic is equally improper.

31. The doctrines of hydrostatics have been deduced by different philosophers from different properties of fluids. Euler has founded his analysis on the following property, "that when fluids are subjected to any pressure, that pressure is so diffused throughout the mass, that when it remains in equilibrio all its parts are equally pressed in every direction (D)." D'Alembert at first (E) deduced the principles of hydrostatics from the property which fluids have of rising to the same altitude in any number of communicating vessels; but he afterwards

(B) Bacon's works, by Shaw, vol. ii. p. 521. *Novum Organum*, part ii. sect. 2. aph. 45. § 222.
(C) See the Philosophical Transactions for 1762 and 1764, vols lii. and liv.
(D) *Nov. Comment. Petropol.* tom. xiii p. 305.
(E) *Melanges de Literature, d'Histoire, et Philosophie.*

Pressure, &c of Fluids.

afterwards * adopted the same property as Euler, from the foundation which it furnishes for an algebraical calculus. The same property has been employed by Bossut, Prony, and other writers, and will form the first proposition of the following chapter.

* *Traité des Fluides*, § 20.

Chap. I. *On the Pressure and Equilibrium of Fluids.*

Proposition I.

32. When a mass of fluid, supposed without weight, is subjected to any pressure, that pressure is so diffused throughout the whole, that when it remains in equilibrio all its parts are equally pressed in every direction.

The parts of a fluid subjected to any pressure, are equally pressed in every direction.

As it is the distinguishing property of fluids that their particles yield to the smallest pressure, and are easily moved among themselves (26.), it necessarily follows, that if any particle is more pressed towards one side than towards another, it will move to that side where the pressure is least; and the equilibrium of the fluid mass will be instantly destroyed. But by the hypothesis the fluid is in equilibrio, consequently the particle cannot move towards one side, and must therefore be equally pressed in every direction.

Plate CCLXIII. Fig. 1.

In order to illustrate this general law, let EF (fig. 1.) be a vessel full of any liquid, and let $m\,u$, $o\,p$ be two orifices at equal depths below its surface; then, in order to prevent the water from escaping, it will be necessary to apply two pistons, A and B, to the orifices $m\,n$, $o\,p$ with the same force, whether the orifice be horizontal or vertical, or in any degree inclined to the horizon; so that the pressure to which the fluid mass is subject, which in this case is its own gravity, must be distributed in every direction. But if the fluid has no weight, then the pressure exerted against the fluid at the orifice $o\,p$, by means of the piston B, will propagate itself through every part of the circular vessel EF, so that if the orifices $m\,n$, $t\,u$ are shut, and $r\,s$ open, the fluid would rush through this aperture in the same manner as it would rush through mn or $t\,u$, were all the other orifices shut. This proposition, however, is true only in the case of perfect fluids; for when there is a sensible cohesion between the particles, as in water, an equilibrium may exist even when a particle is less pressed in one direction than in another; but this inequality of pressure is so exceedingly trifling, that the proposition may be considered as true, even in cases of imperfect fluidity.

Prop. II.

Fig. 1.

33. If to the equal orifices $m\,n$, $t\,u$, $o\,p$, $r\,s$ of a vessel, containing a fluid destitute of weight, be applied equal powers A, B, C, D, in a perpendicular direction, or if the orifices $m\,n$, &c. be unequal, and the powers A, B, &c. which are respectively applied to them be proportional to the orifices, these powers will be in equilibrio.

It is evident, from the last proposition, that the pressure exerted by the power B is transmitted equally to the orifices $m\,n$, $r\,s$, $t\,u$, that the pressure of the power C is transmitted equally to the orifices $m\,n$, $o\,p$, $t\,u$, and so on with all the other powers. Every orifice then is influenced with the same pressure, and, consequently, none of the powers A, B, C, D, can yield to the action of the rest. The fluid mass, therefore, will neither change its form nor its situation, and the powers A, B, C, D will be in equilibrio.—If the powers A, B, C, D are not equal to one another, nor the orifices $m\,n$, $o\,p$, $r\,s$, $t\,u$; but if $A : B = m\,n : o\,p$, and so on with the rest, the fluid will still be in equilibrio. Let A be greater than B, then $m\,n$ will be greater than $o\,p$; and whatever number of times B is contained in A, so many times will $o\,p$ be contained in $m\,n$. If $A = 2\,B$, then $m\,n = 2\,o\,p$, and since the orifice $m\,n$ is double of $o\,p$, the pressure upon it must also be double; and, in order to resist that pressure, the power A must also be double of B; but, by hypothesis, $A = 2\,B$, consequently the pressures upon the orifices, or the powers A, B, will be in equilibrio. If the power A is any other multiple of B, it may be shewn in the same way that the fluid will be in equilibrio.

Prop. III.

34. The surface of a fluid, influenced by the force of gravity and in equilibrio in any vessel, is horizontal, or at right angles to the direction of gravity.

The surface of fluids horizontal. Fig. 2.

Let the surface of the fluid be supposed to assume the waving form APEB. Any particle P in the surface of the fluid is influenced by the force of gravity, which may be represented by PS, and which may be decomposed into two forces Pm, Pn in the direction of the two elementary portions of the surface Pm, Pn (see Dynamics, 148). But since the particle P is in a state of equilibrium, the force of gravity acting in the direction Pm, Pn must be destroyed by equal and opposite forces, exerted by the neighbouring particles against P in the direction mP, nP; therefore the forces Pm, Pn are equal to the forces mP, nP. Now the particle P being in equilibrio, must be equally pressed in every direction (32.) Wherefore the forces Pm, Pn are equal, and by the doctrine of the composition of forces (see Dynamics, 133. D), the angle mPn formed by the two elementary portions Pm, Pn of the surface of the fluid, must be bisected by PS, the line which represents the direction of gravity. The same may be proved of every other point of the surface of the fluid; and therefore this surface must be horizontal or perpendicular to the direction of gravity.

35. This proposition may be otherwise demonstrated. From the principles of mechanics, it is obvious, that when the centre of gravity of any body is at rest, the body itself is at rest; and that when this centre is not supported, the body itself will descend, till it is prevented by some obstacle from getting farther. In the same manner the centre of gravity of a fluid mass will descend to the lowest point possible; and it can be shewn that this centre will be in its lowest position when the surface of the fluid mass is horizontal. For let FGHI (fig. 2.) be any surface, whether solid or fluid, and C its centre of gravity, the point C is nearer the line HI when FG is parallel to HI and rectilineal, than when it has any other form or position. When the surface FGHI is suspended by the point C, or balanced upon it, it will be in equilibrio; but if the line F is made to assume any other form as F$r\,s\,t$G, by removing the portion G$o\,p$ of the surface to $r\,s\,t$, the equilibrium

Fig. 2.

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equilibrium will be destroyed, and the side FG will preponderate. In order, therefore, to restore the equilibrium, the surface must be balanced on a point c farther from HI; that is, the centre of gravity of the surface F$rstop$IH is c. In the same way it may be shewn, that whatever be the form of the bounding line FG, the quantity of surface remaining the same, its centre of gravity will be nearest HI, when FG is rectilineal and parallel to it.—On the truth contained in this proposition depends the art of levelling, and the construction of the spirit level, for an account of which see LEVELLING.

36. As the direction of gravity is in lines which meet near the centre of the earth; and as it appears from this proposition, that the surface of fluids is perpendicular to that direction, their surface will be a portion of a spheroid similar to the earth. When the surface has no great extent, it may be safely considered as a plane; but when it is pretty large, the curvature of the earth must be taken into the account.

PROP. IV.

37. The surface of a fluid influenced by the force of gravity, and contained in any number of communicating vessels, however different in form and position, will be horizontal.

The surface of a fluid in any number of communicating vessels is horizontal. Fig. 3.

Let ABCDE be a system of communicating vessels into which a quantity of fluid is conveyed: It will rise to the same height in each vessel, and have a horizontal surface ABCDE. Suppose AGFE a large vessel full of water. By the last proposition, its surface ABCDE will be horizontal. Now, if any body be plunged into this vessel, the cylinder C for instance, the surface of the fluid will still be horizontal; for no reason could be assigned for the water's rising on one side of this body any more than on another. Let us now take out the cylinder C, and immerge into the fluid, successively, the solid bodies A a, B b, C c, D d, then after each immersion the surface will still be horizontal; and when all these solids are immerged, the large vessel AF will be converted into the system of communicating vessels represented in fig. 4.; in which the surface of the fluid will, of consequence, be horizontal.

Fig. 4.

38. This proposition may be also demonstrated by supposing the parts A a, B b, C c, D d, converted into ice without changing their former magnitude. When this happens, the equilibrium will not be disturbed; and the fluid mass AF, whose surface was proved to be horizontal by the last proposition, will continue in the same state after the congelation of some of its parts. That is, the surface of the fluid in the communicating vessels A, B, C, D, E will be horizontal.

This proposition is not true when the communicating vessels are capillary tubes.

39. When the communicating vessels are so small that they may be regarded as capillary tubes, the surface of the fluid will not be horizontal. From the attraction which all fluids have for glass, they rise to a greater height in smaller tubes than in larger ones, and the quantity of elevation is in the inverse ratio of the diameters of the bores. In the case of mercury, and probably of melted metals, the fluid substance is depressed in capillary tubes, and the depression is subject to the same law. The subject of capillary attraction will be treated at length in a subsequent part of this article.

40. This proposition explains the reason why the surface of small pools in the vicinity of rivers is always on a level with the surface of the rivers themselves, when there is any subterraneous communication between the river and the pool. The river and the pool may be considered as communicating vessels.

PROP. V.

41. If a mass of fluid contained in a vessel be in equilibrio, any particle whatever is equally pressed in every direction, with a force equal to the weight of a column of particles whose height is equal to the depth of the particle pressed below the surface of the fluid.

Immerse the small glass tube mp, into the vessel AB filled with any fluid; then if the tube is not of the capillary kind, the fluid will rise to n on the same level with the surface AB of the fluid in the vessel. Now it is evident, that the particle p at the bottom of the tube mp is pressed downwards by the superincumbent column of particles np, which is equal to the depth of the particle p below the surface of the fluid. But since the mass of fluid is in equilibrio, the particle p is pressed equally in every direction: Therefore, the particle p is pressed equally in every direction by a force equal to the superincumbent column np. Fig 5.

PROP. VI.

42. A very small portion of a vessel of any form, filled with a fluid, is pressed with a force which is in the compound ratio of the number of particles contained in that surface, its depth below the surface of the fluid, and the specific gravity of the fluid.

Let Dp EB be the vessel, and rs a very small portion of its surface, the pressure upon rs is in the compound ratio of the number of particles in rs, and np its depth below the horizontal surface DB. Suppose the glass tube mp to be inserted in the infinitely small aperture p, then, abstracting from the influence of capillary attraction, the fluid in the glass tube will ascend to m on a level with DB, the surface of the fluid in the vessel, and the particle p will be pressed with a column of particles, whose height is np. In the same way it may be shewn, that every other particle contained between r and s is pressed with a similar column. Then, since $p \times np$ will represent the pressure of the column np on the particle p; if N be the number of particles in the space rs, $N \times np$ will be the force of the column supported by the space rs. And as the weight of this column must increase with the specific gravity of the fluid, $S \times N \times np$ will represent its pressure, S being the specific gravity of the fluid.

PROP. VII.

43. The pressure upon a given portion of the bottom of a vessel, whether plane or curved, filled with any

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any fluid, is in the compound ratio of the area of that portion, and the *mean altitude* of the fluid, that is, the perpendicular diftance of the centre of gravity of the given portion from the furface of the fluid; or, in other words, the preffure is equal to the weight of a column of fluid whofe bafe is equal to the area of the given portion, and whofe altitude is the mean altitude of the fluid.

Fig. 5. Let AEGB be the veffel, and AFB the furface of the fluid which it contains. Let GH be a given portion of its bottom, and C the centre of gravity of that portion: Then fhall CF be the mean altitude of the fluid.—Conceive the portion GH to be divided into an infinite number of fmall elements Hh, Gg, &c. then (42.) the preffure fuftained by the elements Hh, Gg, will be refpectively $S \times Hh \times Hw$; $S \times Gg \times Gt$, &c. the fpecific gravity of the fluid being called S. But it follows from the nature of the centre of gravity, that the fum of all thefe products is equal to the product of the whole portion GH into CF the diftance of its centre of gravity from the horizontal furface of the fluid (E). Therefore the preffure upon the portion GH is in the compound ratio of its furface converted into a plane, and the mean altitude of the fluid.

Hydroftatic paradox. 44. From this propofition we may deduce what is generally called the *Hydroftatic paradox*, viz. that *the preffure upon the bottoms of veffels filled with fluid does not depend upon the quantity of fluid which they contain, but upon its altitude;* or, in other words, *that any quantity of fluid, however fmall, may be made to balance any quantity or any weight, however great.* Let ACOQRPDB be a veffel filled with water, the bottom QR will fuftain the fame preffure as if it fupported a quantity of water equal to MQRN. It is evident (43.) that the part EF is preffed with the column of fluid ABEF, and that the part DG equal to CD is pufhed upwards with the weight of a column equal to ABCD. Now, as action and reaction are equal and contrary, the part DG reacts upon FH with a force equal to the weight of the column ABCD, and FH evidently fuftains the fmaller column DGFH; therefore FH fuftains a preffure equal to the weight of the two columns ABCD and DGFH, that is, of the column BIHF. In the fame way it may be fhewn, that any other equal portion of the bottom QR fuftains a fimilar preffure; and therefore it follows, that the preffure upon the bottom QR is as great as if it fupported the whole column MNQR.

Fig. 6.

Fig. 8. 45. The fame truth may be deduced from Prop. IV. For fince the fluid in the two communicating veffels AB, CD will rife to the fame level, whatever be their fize, the fluid in AB evidently balances the fluid in CD; and any furface mn is preffed with the fame force in the direction Bm by the fmall column AB, as it is preffed in the direction Dm by the larger column CD.

Corollaries. 46. Cor. 1. From this propofition it follows, that the whole preffure on the fides of a veffel which are perpendicular to its bafe, is equal to the weight of a rectangular prifm of the fluid, whofe altitude is that of the fluid, and whofe bafe is a parallelogram, one fide of which is equal to the altitude of the fluid, and the other to half the perimeter of the veffel.

Cor. 2. The preffure on the furface of a hemifpherical veffel full of fluid, is equal to the product of its furface multiplied by its radius.

Cor. 3. In a cubical veffel the preffure againft one fide is equal to half the preffure againft the bottom; and the preffure againft the fides and bottom together, is to that againft the bottom alone as three to one. Hence, as the preffure againft the bottom is equal to the weight of the fluid in the veffel, the preffure againft both the fides and bottom will be equal to three times that weight.

Cor. 4. The preffure fuftained by different parts of the fide of a veffel are as the fquares of their depths below the furface; and if thefe depths are made the abfciffa of a parabola, its ordinate will indicate the correfponding preffures.

Definition.

Definition.

47. The *centre of preffure* is that point of a furface expofed to the preffure of a fluid, to which if the total preffure were applied, the effect upon the plane would be the fame as when the preffure was diftributed over the whole furface: Or it is that point, to which if a force equal to the total preffure were applied in a contrary direction, the one would exactly balance the other, or, in other words, the force applied and the total preffure would be *in equilibrio*.

Prop. VIII.

48. The centre of preffure coincides with the centre of percuffion.

To find the centre of preffure. Let AB be a veffel full of water, and CE the fection of a plane whofe centre of preffure is required. Prolong CE till it cuts the furface of the water in M. Take any point D, and draw DO, EP, CN perpendicular to the furface MP. Then if M be made the axis of fufpenfion of the plane CE, the centre of percuffion of

(F). This will be evident from the following propofition. *If every indefinitely fmall part of a furface be multiplied by its perpendicular diftance from a given plane, the fum of the products will be equal to the product of the whole furface, multiplied by the perpendicular diftance of its centre of gravity from the fame plane.* In Plate CCLXIII. Fig. 7. let a, c reprefent two weights fufpended at their centre of gravity by the lines aA, cC attached to the horizontal plane of which ABC is a fection, and let b be the common centre of gravity of thefe weights, and bB the diftance of this centre from the given plane, then $a \times aA + c \times cC = \overline{a+c} \times bB$.—Draw an, cm at right angles to bB. Then fince b is the common centre of gravity of the weights a, c, we fhall have by the fimilar triangles anb, cmb (Euclid VI. 4.) $nb : mb = (ba : bc =) c : a$ (See Mechanics, Centre of Gravity). Hence $a \times nb = c \times mb$, or $a \times \overline{nB - bB} = c \times \overline{bB - mB}$, or $a \times nb - a \times bB = c \times bB - c \times mB$; then, by tranfpofition $a \times nb - c \times mB = a \times bB + c \times bB = \overline{a+C} + bB$. But $nB = aA$ and $mB = cC$, therefore, by fubftitution $a \times aA + c \times cC = \overline{a+c} \times bB$. By fuppofing the two weights a and c united in their common centre of gravity, the fame demonftration may be extended to any number of weights.

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of the plane CE revolving round M will alſo be the centre of preſſure. If MCE moves round M as a centre, and ſtrikes any object, the percuſſive for e of any point C is as its velocity, that is, as its diſtance CM from the centre of motion; therefore the percuſſive force of the points C, D, E, are as the lines CM, DM, EM. But the preſſures upon the points C, D, E, are as the lines CN, DO, EP, and theſe lines are to one another as CM, DM, EM; therefore the percuſſive forces of the points C, D, E, are as the preſſures upon theſe points. Conſequently, the centre of preſſure will always coincide with the centre of percuſſion.

Sect. II. *Inſtruments and Experiments for illuſtrating the Preſſure of Fluids.*

Machine for illuſtrating the hydroſtatic paradox.

Plate CCLXIV. Fig. 1.

49. We have already ſhewn in art. 41. that the preſſure upon the bottoms of veſſels filled with fluids does not depend upon the quantity of fluid which they contain, but upon its particular altitude. This propoſition has been called the Hydroſtatical Paradox, and is excellently illuſtrated by the following machine. In fig. 1. AB is a box which contains about a pound of water, and *a b c d* a glaſs tube fixed to the end C of the beam of the balance, and the other end to a moveable bottom which ſupports the water in the box, the bottom and wire being of equal weight with an empty ſcale hanging at the other end of the balance. If one pound weight be put into the empty ſcale, it will make the bottom riſe a little, and the water will appear at the bottom of the tube *a*, conſequently it will preſs with a force of one pound upon the bottom. If another pound be put into the ſcale, the water will riſe to *b*, twice as high as the point *a*, above the bottom of the veſſel. If a third, a fourth, and a fifth pound be put ſucceſſively into the ſcale, the water will riſe at each time to *c*, *d*, and *e*, the diviſions *ab*, *bc*, *cd*, *de* being all equal. This will be the caſe, however ſmall be the bore of the glaſs tube; and ſince when the water is at *b*, *c*, *d*, *e*, the preſſures upon the bottom are ſucceſſively twice, thrice, four times, and five times as great as when the water was contained within the box, we are entitled to conclude that the preſſure upon the bottom of the veſſel depends altogether on the altitude of the water in the glaſs tube, and not upon the quantity it contains. If a long narrow tube full of water, therefore, be fixed in the top of a caſk likewiſe full of water, then though the tube be ſo ſmall as not to hold a pound of the fluid, the preſſure of the water in the tube will be ſo great on the bottom of the caſk as to be in danger of burſting it; for the preſſure is the ſame as if the caſk was continued up in its full ſize to the height of the tube, and filled with water. Upon this principle it has been affirmed that a certain quantity of water, however ſmall, may be rendered capable of exerting a force equal to any aſſignable one, by increaſing the height of the column, and diminiſhing the baſe on which it preſſes. This, however, has its limits; for when the tube becomes ſo ſmall as to belong to the capillary kind, the attraction of the glaſs will ſupport a conſiderable quantity of the water it contains, and therefore diminiſh the preſſure upon its baſe.

The ſmalleſt quantity of water may exert a force equal to any aſſignable one.

Conſtruction of the preceding machine. Fig. 2.

50. The preceding machine muſt be ſo conſtructed, that the moveable bottom may have no friction againſt the inſide of the box, and that no water may get between it and the box. The method of effecting this will be manifeſt from fig. 2. where ABCD is a ſection of the box, and *a b c d* its lid, which is made very light. The moveable bottom E, with a groove round its edges, is put into a bladder *f g*, which is tied cloſe around it in the groove, by a ſtrong waxed thread. The upper part of the bladder is put over the top of the box at *a* and *d* all around, and is kept firm by the lid *a b c d*, ſo that if water be poured into the box through the aperture *l l* in its lid, it will be contained in the ſpace *f E g h*, and the bottom may be raiſed by pulling the wire *i* fixed to it at E.

The upward preſſure of fluids illuſtrated by the hydroſtatic bellows. Figs. 3, 4, 5.

51. The upward preſſure of fluids is excellently illuſtrated by the hydroſtatic bellows. The form given to this machine by the ingenious Mr Ferguſon (*Lectures*, vol. ii. p. 111.) is repreſented in fig. 3. where ABCD is an oblong ſquare box, into one of whoſe ſides is fixed the upright glaſs tube *a* I, which is bent into a right angle at the lower end as at *i*, fig. 4. To this bent extremity is tied the neck of a large bladder K, which lies in the bottom of the box. Over this bladder is placed the moveable board L, figs. 3. and 4. in which the upright wire M is fixed. Leaden weights NN, with holes in their centre, to the amount of 16 pounds, are put upon this wire, and preſs with all their weight upon the board L. The croſs bar *p* is then put on, in order to keep the glaſs tube in an upright poſition; and afterwards the piece EFG for keeping the weights NN horizontal, and the wire M vertical. Four upright pins, about an inch long, are placed in the corners of the box, for the purpoſe of ſupporting the board L, and preventing it from preſſing together the ſides of the bladder. When the machine is thus fitted up, pour water into the tube I till the bladder is filled up to the board L. Continue pouring in more water, and the upward preſſure which it will excite in the bladder will raiſe the board with all the weights NN, even though the baſe of the tube ſhould be ſo ſmall as to contain no more than an ounce of water.

Experiment for ſhewing that the preſſure of fluids ariſes from their gravity, and is propagated in every direction.

52. That the preſſure of fluids ariſes from their gravity, and is propagated in every direction, may be proved by the following experiment. Inſert into an empty veſſel, a number of glaſs tubes bent into various angles. Into their lower orifices introduce a quantity of mercury, which will reſt in the longer legs on a level with theſe orifices. Let the veſſel be afterwards filled with water; and it will be ſeen, while the veſſel is filling, that the mercury is gradually preſſed from the lower orifices towards the higher, where the water is prevented from entering. Now, in conſequence of the various angles into which the glaſs tubes are bent, the lower orifices point to almoſt every direction; and therefore it follows, that the preſſure of the ſuperincumbent water is propagated in every direction. When a ſtraight tube is employed to ſhew the upward preſſure of fluids, the mercury which is introduced into its lower extremity muſt be kept in by the finger till the height of the water above the orifice is equal to fourteen times the length of the column of quickſilver: When the finger is removed the mercury will aſcend in the tube.

Experiment for ſhewing that the ſuperior ſtrata preſs upon the inferior ſtrata of fluids.

53. The preſſure of the ſuperior ſtrata of fluids upon the inferior ſtrata may be ſhown in the following manner. Immerſe two tubes of different bores, but not of the capillary kind, in a veſſel of mercury. The mercury will riſe in the tube on a level with its ſurface in

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in the veſſel. Let water be then poured upon the mercury ſo as not to enter the upper orifices of the tubes, the preſſure of the water upon the inferior fluid will cauſe the mercury to aſcend in the tubes above the level of that in the veſſel, but to the ſame height in both tubes. The columns of quickſilver in the two tubes are evidently ſupported by the preſſure of the water on the inferior fluid. The ſame experiment may be made with oil and tinged water, the latter being made the inferior fluid.

Deſcription of the ſyphon. Fig. 6.

54. The ſyphon is an inſtrument which ſhews the gravitation of fluids, and is frequently employed for decanting liquors. It is nothing more than a bent tube EABCF, having one of its legs longer than the other. The ſhorter leg BCF is immerſed in the fluid contained in the veſſel D; and if, by applying the mouth to the orifice E, the air be ſucked out of the tube, the water in the veſſel D will flow off till it be completely emptied. Now it is obvious that the atmoſphere which has a tendency to raiſe the water in the ſhorter leg EB by its preſſure on the ſurface of the water at C, has the ſame tendency to prevent the water from falling from the orifice E, by its preſſure there, and therefore if the ſyphon had equal legs as AB, BC, no water could poſſibly iſſue from the orifice E. But when the leg EB is longer than BC, the column of fluid which it contains being likewiſe longer, will by its ſuperior weight cauſe the water to flow from the orifice E, and the velocity of the iſſuing fluid will increaſe as the difference between the two legs of the ſyphon is made greater.

Experiment for ſhewing that the effect of the ſyphon depends on the gravitation of fluids. Fig. 7.

55. In order to ſhew that the effect of the ſyphon depends upon the gravitation of fluids, M. Paſcal deviſed the following experiment. In the large glaſs veſſel AB, faſten by means of bees wax two cylindrical cups *a*, *b*, containing tinged water, whoſe ſurface is about an inch higher in the one than in the other. Into the tinged water inſert the legs of a glaſs ſyphon *c d*, having an open tube *e* fixed into the middle of it, and put a wooden cover on the veſſel with a hole in its centre to receive the tube and keep it in a vertical poſition. Then through the funnel *f*, fixed in another part of the cover, pour oil of turpentine into the larger veſſel till it flow into the cups *a*, *b*, and riſe above the arch of the ſyphon. The preſſure of the oil upon the tinged water in the cups will cauſe the water to paſs through the ſyphon from the higher cup to the lower, till the ſurfaces of the water in both the cups be reduced to a level. In order to explain this, ſuppoſe a horizontal plane *e b* to paſs through the legs of the ſyphon, and the tinged water in the cups, the parts of this plane within the legs when the ſyphon is full, will be equally preſſed by the columns of tinged water *c e*, *d b* within the ſyphon; but the equal parts of this plane between the circumference of each leg of the ſyphon, and the circumference of each cylindrical cup, their diameters being equal, will ſuſtain unequal preſſures from their ſuperincumbent columns, though the altitudes of theſe columns be equal. For ſince the preſſure upon *e* is exerted by a column of oil *a c*, and a column of water *a e*, whereas the preſſure upon *b* is exerted by a column of oil *h d*, and a column of water *h b*; the column *c e* which contains the greateſt quantity of water, will evidently exert the greateſt force, and by its preſſure will drive the tinged water from the cup *a*, through the ſyphon *a c d* into the cup *b*, until a perfect equilibrium is obtained by an equality between the columns of water *a e* and *h b*.

Sect. III. *Application of the Principles of Hydroſtatics to the Conſtruction of Dykes*, &c. *for reſiſting the preſſure of water.*

Definition.

Definition.

A dyke is an obſtacle either natural or artificial, which oppoſes itſelf to the conſtant effort of water to ſpread itſelf in every direction.

Different ways in which a dyke may yield to the preſſure of water. Fig. 8.

56. In diſcuſſing this important branch of hydraulic architecture, we muſt inquire into the thickneſs and form which muſt be given to the dyke in order to reſiſt the preſſure of the water. In this inquiry the dyke may be conſidered as a ſolid body which the water tends to overthrow by turning it round upon its poſterior angle C; or it may be regarded as a ſolid, whoſe foundation is immoveable, but which does not reſiſt the preſſure of the water through the whole of its height, and which may be ſeparated into horizontal ſections by the efforts of the fluid. A dyke may be conſidered alſo as a ſolid body which can be neither broken nor overturned, but which may be puſhed horizontally from its baſe, and can preſerve its ſtability only by the friction of its baſe on the ground which ſupports it. On theſe conditions are founded the calculations in the following propoſition which contain the moſt uſeful information that theory can ſuggeſt upon the conſtruction of dykes.

Prop. I.

To find the dimenſions of a dyke when the water tends to turn it round its poſterior angle. Fig. 8.

57. To find the dimenſions of a dyke which the water tends to overthrow by turning it round its poſterior angle.

Let ABCD be the ſection of the dyke, conſidered as a continuous ſolid, or a piece of firm maſonry, HK the level of the water which tends to overthrow it by turning it round its poſterior angle C, ſuppoſed to be fixed, and let AC, BD, be right lines or known curves. It is required to determine CD the thickneſs which muſt be given to its baſe to prevent it from being overturned.

To the ſurface of the water HK draw the ordinates PM, *p m* infinitely near each other, and let fall from the points H and M the perpendiculars HT, MX. Draw the horizontal line ML and raiſe the perpendicular CL, and ſuppoſe

HP	$= x$
PM	$= y$
P*p* or MV the fluxion of x	$= \dot{x}$
V*m* the fluxion of y	$= \dot{y}$
HT	$= a$
DT	$= b$
CD	$= z$
The momentum of the area ABCD, or the force with which it reſiſts being turned round the fulcrum C	$= Z$
The ſpecific gravity of water	$= s$
The ſpecific gravity of the dyke	$= \sigma$.

58. It is obvious from art. 41. that every element ſuſtains a perpendicular preſſure proportional to the height PM. Let RM perpendicular to M*m* repreſent the force

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force exerted by the column of water MmpP, and let it be decomposed into two other forces, one of which RQ is horizontal and has a tendency to turn the dyke round the point C, and the other RY is vertical and tends to press the dyke upon its base. The force RQ is evidently $=s \times y \times Mm$, (42.) and therefore the horizontal part of it will be only $sy \times Mm \times \frac{RQ}{RM}$. But the triangles RQM, MVm are evidently similar; consequently RQ : RM$=$Vm : Mm; hence $\frac{RQ}{RM}=\frac{Vm}{Mm}=\frac{\dot{y}}{Mm}$. Wherefore by substitution we have the force RQ$=$ $sy \times Mm \times \frac{\dot{y}}{Mm}$, and dividing by M$m$, we have RQ $=sy\dot{y}$. The force RQ, therefore, will always be the same as the force against Vm, whatever be the nature of the curve BD. Now the momentum of this force with relation to the fulcrum C, or its power to make the dyke revolve round C, is measured by the perpendicular CL let fall from the centre of motion to the direction in which the force is exerted (See MECHANICS) consequently this momentum will be $sy\dot{y} \times$ CL $=sy\dot{y} \times a-y$ (since CL$=$HT$-$PM$=a-y$)$=say\dot{y}$ $-syy\dot{y}$, whose fluent is $\frac{sayy}{2}-\frac{sy^3}{3}$, which by supposing $y=a$ becomes $\frac{1}{6}sa^3$ for the total momentum of the horizontal effort of the water to turn the dyke round C. The vertical force RY or QM, which presses the dyke upon its base, is evidently $sy \times Mm \times \frac{MQ}{RM}$, but on account of the similar triangles $\frac{MQ}{RM}=\frac{\dot{x}}{Mm}$, consequently by substitution we shall have the force RY $=sy \times Mm \times \frac{\dot{x}}{Mm}=sy\dot{x}$, after division by M$m$. The momentum, therefore, of the vertical force RY with relation to C, or its power to prevent the dyke from moving round the fulcrum C, will be $sy\dot{x} \times$ CX; CX being the arm of the lever by which it acts, or the perpendicular let fall from the fulcrum upon the direction of the force. Now CX$=$CD$-$DT$+$TX or HP, that is CX$=z\overline{-b+x}$, therefore the momentum of the force RY$=sy\dot{x} \times \overline{z-b+x}$, and the sum of the similar momenta from F to H will be the fluent $\int(\overline{z-b+x})\,sy\dot{x}$, the combined momentum of all the vertical forces which resist the efforts of the horizontal forces to turn the dyke round C. But the efforts of the horizontal forces are also resisted by the weight of the dyke whose momentum we have called Z, therefore σZ, σ being the specific gravity of the dyke, will be the momentum of the dyke. We have now three forces acting at once, viz. the horizontal force of the water striving to overturn the dyke, and the vertical force of the water combined with the momentum of the dyke, striving to resist its overthrow, therefore we shall have an equilibrium between these three forces, when the momentum of the horizontal forces is made equal to the momentum of the vertical forces, added to that of the dyke itself, consequently

$$\tfrac{1}{6}sa^3=\int(z-b+x)\,sy\dot{x}+\sigma Z.$$

59. As it is necessary, however, to give more stability to the dyke than what is just requisite to preserve its equilibrium, we must make its dimensions such as to resist a force greater than the horizontal forces, a force, for example, n times the momentum of the horizontal forces (G). The equation will therefore become

$$\text{(I.)}\quad n \times \tfrac{1}{6}sa^3=\int(z-b+x)\,sy\dot{x}+\sigma Z,$$

which comprehends every possible case of stability, for if we wish the stability of the dyke to have double the stability of equilibrium, we have only to make $n=2$. The preceding general equation is susceptible of a variety of applications according to the nature of the curves which form the sides of the dyke. It is at present worthy of remark that since the momentum of the horizontal forces is always the same whatever be the curvature of the sides AC, BD, and since the momentum of the vertical forces increases as the angle CDH diminishes, it follows that it will always be advantageous to diminish the angle CDH and give as much slope as possible to the sides of the dyke.

Equation containing the conditions of equilibrium on the supposition that the dyke may slide upon its base.

60. Let us now consider the conditions that may be necessary to prevent the dyke ABCD from sliding on its base CD. Since the base of the dyke is supposed horizontal, the force which the dyke opposes to the horizontal efforts of the water arises solely from the adhesion of the dyke to its base and from the resistance of friction. These two forces, therefore, combined with the weight of the dyke, form the force which resists the horizontal efforts of the water; an equilibrium will consequently obtain when the three first forces are made equal to the last. But the force of adhesion, and the resistance of friction, being unknown, may be made equal to the weight of the dyke multiplied by the constant quantity m, which must be determined by experience. Now calling A the area of the section ABCD, we shall have σA for its weight, and $m\sigma$A for the resistance which is opposed to the horizontal efforts of the water. But we have already seen that the horizontal forces of the water upon M are equal to $sy\dot{y}$, whose fluent $\frac{1}{2}sa^2$ (when $a=y$) is the sum of all the horizontal forces, consequently when an equilibrium takes place between these opposing forces we shall have

$$\text{(II.)}\quad m\sigma A=\tfrac{1}{2}sa^2,\ \text{or}\ A=\frac{s}{\sigma} \times \frac{a^2}{2m}.$$

We might have added to the weight of the dyke the vertical pressure of the water, but it has been neglected for the purpose of having the dyke sufficiently strong to resist an additional force.

61. We

(G) The dimensions of the dyke would be sufficiently strong to resist any additional force by neglecting the term σZ, which represents the vertical pressure of the water tending to keep the dyke upon its base.

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Form of the general equation when the sides of the dyke are rectilineal. Fig. 9.

61. We shall now proceed to inquire into the form which the general equation assumes when the sides of the dyke are rectilineal. Let AC, BD, fig. 9. be two lines inclined to the horizon under given angles ACD, BDC, and let AB, CD be two horizontal lines. Retaining the construction and symbols in art. 57. let fall AQ, BZ perpendicular to CD, and make $AQ=BZ=d$; $CQ=r$ and $DZ=r'$.

On account of the similar triangles HPM, FTH we shall have $a:b=y:x$, and therefore $x=\frac{by}{a}$. Substituting this value of x, instead of x in the general equation, art. 54. we have $\int(z-b+x)sy\dot{x}=\int\frac{sb}{a}\left(z-b+\frac{by}{a}\right)y\dot{y}=\frac{sbzyy}{2a}-\frac{sbbyy}{2a}+\frac{sbby^3}{3a^2}=$ (making $y=a$) $\frac{sbza}{2}-\frac{sb^2a}{6}$; now the momentum of the dyke ABCD with relation to C, is equal to the whole area of the dyke ABCD collected in its centre of gravity, and placed at the end of a lever whose length is the horizontal distance of that centre of gravity from the fulcrum C. But the area of $ABQZ=QZ\times ZB=\overline{z-r'-r}\times d$; the area of the triangle $ACQ=\frac{CQ\times QA}{2}=\frac{dr}{2}$, and the area of the triangle $BZD=\frac{DZ\times ZB}{2}=\frac{dr'}{2}$. Now the lever by which the area ABQZ collected in its centre of gravity F, acts upon the fulcrum, is evidently $=Cf=CQ+Qf=CQ+\frac{1}{2}QZ=r+\frac{z-r'-r}{2}$, consequently the momentum by which the area ABCD resists the horizontal forces that conspire to give it a motion of rotation about C will be $=\overline{z-r'-r}\times d\times\overline{r+\frac{z-r'-r}{2}}$. The lever by which the triangle BZD acts, when collected in its centre of gravity I, is evidently Ci; but by the property of the centre of gravity $Di=\frac{2}{3}DZ=\frac{2r'}{3}$, hence $Ci=CD-Di=z-\frac{2r'}{3}$, consequently the energy of the triangle BZD to resist the efforts of the water acting horizontally will be $=\frac{dr'}{2}\times\overline{z-\frac{2r'}{3}}$. The lever of the triangle ACQ is plainly $Cs=\frac{2}{3}CQ=\frac{2r}{3}$, consequently the momentum of ACQ collected in its centre of gravity S will be $=\frac{dr}{2}\times\frac{2r}{3}$. Having thus found the momentum of the rectangle ABQZ, and of the triangles BZD, ACQ, the sum of these momenta will be the momentum Z, with which the dyke opposes the horizontal efforts of the water, therefore we shall have

$$Z=\overline{z-r'-r}\times d\times\overline{r+\frac{z-r'-r}{2}}+\frac{dr'}{2}\times\overline{z-\frac{2r'}{3}}+\frac{dr}{2}\times\frac{2r}{3}$$

and by multiplication

$$Z=\frac{dzz}{2}-\frac{dr'z}{2}+\frac{dr'r'}{6}-\frac{drr}{6}.$$

By substituting this value of Z in the general equation in art. 54. we shall have

Resulting equation for finding the thickness of a dyke, when both its sides are rectilineal and inclined.

$$\text{(III.)}\ n\times\tfrac{1}{6}sa^3=\frac{sbza}{2}-\frac{sbba}{6}+\frac{\sigma dzz}{2}-\frac{\sigma dr'z}{2}+\frac{\sigma dr'r'}{6}-\frac{\sigma drr}{6},$$

a quadratic equation which will determine in general the base z of a dyke when its sides are rectilineal and inclined at any angle to the horizon.

Resulting equation when the posterior side of the dyke is vertical.

62. When the angle ACQ is a right angle, or when the posterior side AC of the dyke is perpendicular to the horizon, the quantity r becomes $=o$, and the last term of the preceding equation in which r appears will vanish, consequently the equation will now become

$$\text{(IV.)}\ n\times\tfrac{1}{6}sa^3=\frac{sbza}{2}-\frac{sbba}{6}+\frac{\sigma dzz}{2}-\frac{\sigma dr'z}{2}+\frac{\sigma dr'r'}{6}.$$

Resulting equation when both sides of the dyke are vertical.

63. When the angles ACQ and BDZ are both right, the dyke becomes rectangular, with its sides perpendicular to its base. In this case both r and r' become each $=o$, and therefore all the terms in which they are found will vanish. In this case too $DT=b$ becomes $=o$, and therefore the terms in which it appears will likewise vanish. The general equation will now become

$$\text{(V.)}\ n\times\tfrac{1}{6}sa^3=\frac{\sigma dzz}{2}\ \text{a pure quadratic.}$$

Application of the formulæ.

64. In order to shew the application of the preceding formulæ, and at the same time the advantages of inclining the sides of the dyke, let us suppose the depth of the water and also the height of the dyke to be 18 feet, so that B will coincide with H. Let us also suppose, what is generally the case in practice, that the declivity of the sides is $\frac{1}{6}$ of their altitude, that is $DZ=CQ=\frac{1}{6}BZ$. Let the specific gravity of the dyke be to that of water as 12 to 7; and suppose it is wished to make the stability of the dyke twice as great as the stability of equilibrium, that is, to make it capable of resisting a force twice as great as that which it really sustains. Then, upon these conditions, we shall have $BZ=HT$ or $a=d=18$ feet; $CQ=DZ=DT$ or $r'=r=b=3$ feet; $s=7$; $\sigma=12$, and $n=2$. By substituting these numerical values in the general equation N° III. it becomes

$$zz-\frac{45}{36}z=\frac{4599}{39}\ \text{feet}$$

a quadratic equation which after reduction will give $z=12$ feet nearly. When $z=12$ the area of the dyke ABCD will be 162 square feet.

Advantages of inclining the sides of the dyke.

65. Let us now suppose the sides of the dyke to be vertical, the equation N° V. will give us $z=11$ feet 2 inches, which makes the area of the dyke more than 201 square feet. The area of the dyke with inclined sides

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sides is therefore to its area with vertical sides nearly as 4 to 5: and hence we may conclude that a dyke with inclined sides has the same stability as a dyke with vertical sides; while it requires $\frac{1}{5}$ less materials.

PROP. II.

To find the dimensions of the dyke when the water tends to separate it into horizontal sections or laminæ.

66. To find the dimensions of a dyke which can neither slide upon its base, nor turn round its posterior angle; but which is composed of horizontal sections, which may be separated from each other.

In solving this proposition we must find the curvature of the side exposed to the pressure of the water, which will make all the different sections or horizontal laminæ equally capable of resisting the different forces which tend to separate them. If the lamina NM does not resist the column PM, which partly presses it in the direction MN as powerfully as the lamina nm resists the horizontal pressure of the column pm, the lamina NM is in danger of being separated from the lamina nm. But if all the laminæ NM, nm resist with equal force the horizontal effects of the water, and if the dyke cannot be made to slide upon its base nor turn round its posterior angle T, it cannot possibly yield to the pressure of the water; for it is impossible to separate one lamina from another, unless the one opposes a less resistance than the other. To simplify the investigation as much as possible, let us suppose the posterior side of the dyke to be vertical, and the depth of the water to be equal to the height of the dyke.

Fig. 10.

67. Let ABC be the section of the dyke, AK the surface of the water, AC the curvature required, AB its posterior side; MNnm a horizontal lamina infinitely small, in the direction of which the dyke has a tendency to break in consequence of the efforts of the water upon AM.

If the dyke should break in the direction MN, the superior part AMN will detach itself from the inferior part MNBC, by moving from M towards N; and at the moment when the impulse takes place it will have a small motion of rotation round the point N. We must therefore determine the forces which act upon the lamina MNnm, and form an equation expressing their equilibrium round the point N. The forces alluded to are evidently, 1. The horizontal efforts of the water; 2. The vertical efforts of the water; 3. The weight of the part AMN; and, 4. The adhesion of the two surfaces MN, mn. Of these four forces the first is the only one which has a tendency to overthrow the portion AMN of the dyke; and its efforts are resisted by the three other forces. In order to find the momenta of these forces with regard to the point N let us suppose

Enumeration of the forces which act upon the dyke.

AP=NM	$=x$
PM	$=y$
The specific gravity of water	$=s$
The specific gravity of the dyke	$=\sigma$

Then we shall have,

Momentum of these forces.

1. The momentum of the horizontal forces of the water will be $=\frac{1}{6}sy^3$, by the same reasoning that was employed in art. 57.

2. The momentum of the part AMN of the dyke will be $=\sigma\int x\dot{y}$ the area of the surface AMN, multiplied by the distance of its centre of gravity from the fulcrum N, which is equal to $\frac{\frac{1}{2}\int xx\dot{y}}{\int x\dot{y}}$. See MECHANICS.

68. In order to simplify the calculus, and at the same time increase the stability of the dyke, we shall neglect the vertical force of the water, and the adhesion of the two surfaces MN, mn. The only forces therefore which we have to consider, are the horizontal efforts of the water acting against the momentum of the superior part AMN. By making an equilibrium between these forces we shall have the following equation.

$$\tfrac{1}{6}sy^3=\sigma\int x\dot{y}\times\frac{\frac{1}{2}\int xx\dot{y}}{\int x\dot{y}}=\tfrac{1}{2}\sigma\times\int xx\dot{y}$$

By taking the fluxion we have

$\frac{1}{2}sy^2\dot{y}=\frac{1}{2}\sigma\times xx\dot{y}$. Dividing by $\dot{y}$ we have

$\frac{1}{2}sy^2=\frac{1}{2}\sigma\times x^2$, which by reduction becomes

$$y=\sqrt{\frac{\sigma}{s}}\times x.$$

The line AMC therefore is rectilineal, and the base BC is to the altitude BA as $\sqrt{s}:\sqrt{\sigma}$; that is, as the square root of the specific gravity of water is to the square root of the specific gravity of the dyke.

69. In order to prevent the superior portion AMN from sliding on its base MN, we must procure an equilibrium between the adhesion of the surfaces MN, mn and the horizontal force exerted by the water. Now the sum of all the horizontal forces exerted by the water is (by art. 58.) $\frac{1}{2}sy^2$, and the adhesion may be represented by some multiple m, of its weight, the constant quantity m being determined by experience. The adhesion will therefore be $m\times\sigma\int x\dot{y}$, and the equation of equilibrium will be

Equation containing the conditions of equilibrium on the supposition that the dyke may slide upon its base.

$\frac{1}{2}sy^2=m\times\sigma\int x\dot{y}$, the fluxion of which is

$sy\dot{y}=m\times\sigma x\dot{y}$. Dividing by $\dot{y}$ we have

$sy=m\sigma x$, and therefore

$x:y=s:m\sigma n$.

Hence the base BC of the dyke is to its altitude BA as the specific gravity of water is to a multiple m of the specific gravity of the dyke, m being a constant quantity which experiments alone can determine.

In a work by the Abbé Bossut and M. Viallet, entitled *Recherches sur la Construction la plus avantageuse des Digues*, the reader will find a general solution of the preceding problem, in which the vertical efforts of the water and the adhesion of the surfaces are considered. This able work, which we have followed in the preceding investigation, contains much practical information on the construction of dykes of every kind; and may be considered as a continuation of the second part of Belidor's *Architecture Hydraulique*.

CHAP.

Of Specific Gravities.

Chap. II. *Of Specific Gravities.*

Definition.

Specific gravity defined.

70. The absolute weights of different bodies of the same bulk are called their *specific gravities* or *densities*; and one body is said to be *specifically heavier*, or *specifically lighter* than another, when under the same bulk it contains a greater or less quantity of matter. Brass, for example, is said to have eight times the specific gravity of water, because one cubic inch of brass contains eight times the quantity of matter, or is eight times heavier than a cubic inch of water.

Prop. I.

71. Fluids pressing against each other in two or more communicating vessels, will be in equilibrio when the perpendicular altitudes above the level of their junction are in the inverse ratio of their specific gravities.

Plate CCLXV. Fig. 1.

If a quantity of mercury be poured into the vessel FMN, it will be in equilibrio when it rises to the same level AHIB in both tubes. Take away an inch of mercury ACDH, and substitute in its room $13\frac{1}{2}$ inches of water FCDG. Then since mercury is $13\frac{1}{2}$ times heavier than water, $13\frac{1}{2}$ inches of water will have the same absolute weight as one inch of mercury, and the equilibrium will not be disturbed; for the column of water FD will exert the same pressure upon the surface CD of the mercury, as the smaller column of mercury did formerly. The surface of the mercury, therefore, will remain at IB: now, since AB, CE, are horizontal lines, AC will be equal to LK; but FC was made $13\frac{1}{2}$ times AC, therefore $FC = 13\frac{1}{2}$ times IK, that is $FC : IK = 13\frac{1}{2} : 1$, the ratio between the specific gravities of mercury and water.

Construction of the barometer.

72. On this proposition depends the theory of the barometer. Let a quantity of mercury be introduced into the tube FMN, and let the pressure of the atmosphere be removed from the surface IB; the pressure of the air upon the other surface CD will be the same as if the tube FD were continued to the top of the atmosphere, and therefore, instead of the column of water FD we have a column of air equal to the height of the atmosphere acting against the mercury CDMIB; the mercury consequently will rise towards N, so that its height will be to the height of the atmosphere as the specific gravity of air is to the specific gravity of mercury; but as the density of the air diminishes as it recedes from the earth, we must take the specific gravity of the air at a mean height in the atmosphere. It is obvious from the proposition, that the altitude of the column of mercury which balances the column of air must be reckoned from CD the level of their junction; and that, when the specific gravity of the air is diminished, the mercury will fall, and will again rise when it regains its former density.

Prop. II.

Bodies immersed in a fluid are pressed upwards with a force equal to the weight of the quantity of fluid displaced.

73. If any body is immersed in a fluid, or floats on its surface, it is pressed upwards with a force equal to the weight of the quantity of fluid displaced.

Demonstration when a parallelopiped is immersed in the fluid. Fig. 2.

Let mH be the section of a body immersed in the vessel AB filled with a fluid. Any portion mn of its upper surface is pressed downwards by the column of fluid CmnD (43.); but the similar portion EF of its lower surface is pressed upwards with a column of fluid equal to CEFD, therefore the part EF is pressed upwards with the difference of these forces, that is, with a force equivalent to the column of fluid mEFn, for $\text{CEFD} - \text{C}mn\text{D} = m\text{EF}n$. In the same way it may be shewn, that the remaining part FH is pressed upwards with a force equal to the weight of a column nFHo; and therefore it follows, that the rectangle mEHo is pressed upwards with a force equivalent to a column mEHo, that is, to the quantity of fluid displaced.

When the parallelopiped floats in the fluid. Fig. 3.

74. If the body floats in the fluid like CH in the vessel AB (fig. 3.) the same consequence will follow; for the body CH is evidently pressed upwards with a force equivalent to the column mEHo, that is, to the part immersed or the quantity of fluid displaced. Now as the same may be demonstrated of every other section of a solid parallelopiped, we may conclude, that the proportion is true with respect to every solid whose section is rectangular.

When the solid has any other form. Fig. 4.

75. When the solid has any other form as CD, however irregular, we may conceive its section to be divided into a number of very small rectangles no: then (41.) the small portion of the solid at n is pressed downwards by a column of particles mn, and the small portion at o is pressed upwards by a column of particles equal to no; therefore the difference of these forces, viz. the column no, is the force with which the portion o is pressed upwards. In the same manner it can be shewn, that every other similar portion of the lower surface of the solid CD is pressed upwards with a force equal to a column of particles whose height is equal to the vertical breadth of the solid; but all these columns of particles must occupy the same space as the solid itself, therefore any solid body immersed in a fluid, or floating on its surface, is pressed upwards with a force equal to the weight of the quantity of fluid displaced.

The weight of a floating body is equal to the weight of the quantity of fluid displaced.

76. Cor. 1. When a body floats in a fluid, the weight of the quantity of fluid displaced is equal to the weight of the floating solid. For since the solid is in equilibrium with the fluid, the force which causes it to descend must be equal to the force which presses it upwards; but the force which keeps a part of the solid immerged in the fluid is the weight of the solid, and the force which presses the solid upwards, and prevents it from sinking, is equivalent to the weight of the quantity of fluid displaced (73.); therefore these forces and the weights to which they are equivalent must be equal.

77. Cor. 2. A solid weighed in a fluid loses as much of its weight as is equal to the weight of the quantity of fluid displaced; for since the body is pressed upwards with a force equal to the weight of the fluid displaced (73.), this pressure acts in direct opposition to the natural gravity or absolute weight of the solid, and therefore diminishes its absolute weight by a quantity equal to the weight of the fluid displaced. The part of the weight thus lost is not destroyed: It is only sustained by a force acting in a contrary direction.

78. Cor. 3. A solid immersed in a fluid will sink, if its specific gravity exceed that of the fluid: It will float

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float on the ſurface, partly immerſed, if its ſpecific gravity be leſs than that of the fluid; and it will remain wholly immerſed wherever it is placed, if the ſpecific gravities of the ſolid and fluid are equal. In the firſt caſe, the force with which the ſolid is preſſed downwardly exceeds the upward preſſure, and therefore it muſt ſink. In the ſecond caſe, the upward preſſure exceeds the preſſure downwards, and therefore the body muſt float; and, in the third caſe, the upward and downward preſſures being equal, the ſolid will remain wherever it is placed.

79. Cor. 4. The ſpecific gravities of two or more fluids are to one another as the loſſes of weight ſuſtained by the ſame ſolid body, and ſpecifically heavier than the fluids, when weighed in each fluid reſpectively. The ſolid in this caſe diſplaces equal quantities of each fluid; but the loſſes of weight are reſpectively as the abſolute weights of the quantities diſplaced (Cor. 2.), therefore the ſpecific gravities, which are as the abſolute weights of equal quantities of any body (70.), muſt be as the loſſes of weight ſuſtained by the immerſed ſolid.

80. Cor. 5. The ſpecific gravity of a ſolid is to that of a fluid as the abſolute weight of the ſolid is to the loſs of weight which it ſuſtains when weighed in the fluid. For ſince the loſs of weight ſuſtained by the ſolid is equal to the abſolute weight of the quantity of fluid diſplaced, or of a quantity of fluid of the ſame bulk as the ſolid, the ſpecific gravities, which (70.) are in the ratio of the abſolute weights of equal volumes, muſt be as the abſolute weight of the ſolid to the leſs weight which it ſuſtains.

81. Cor. 6. The ſpecific gravity of a ſolid floating in a fluid, is to the ſpecific gravity of the fluid itſelf, as the bulk of the part immerſed is to the total bulk of the ſolid.

82. Cor. 7. Bodies which ſuſtain equal loſſes of weight are of the ſame bulk. For, ſince the loſſes of weight are as the weights of the quantities of fluid diſplaced, and as the quantities diſplaced are as the bulks of the ſolids which diſplace them, the bulks muſt be equal when the loſſes of weight are equal.

The preceding corollaries deduced from an equation of equilibrium.

83. The preceding corollaries may be expreſſed algebraically, and may be deduced from a general equation in the following manner. Let B be the total bulk of a floating body, and C the part of it which is immerſed; let S be the ſpecific gravity of the ſolid, and s that of the fluid. Then it is obvious, that the abſolute weight of the ſolid will be expreſſed by $B\times S$, and the abſolute weight of the fluid diſplaced by $C\times s$; for the fluid diſplaced has the ſame bulk as the part of the ſolid which is immerſed. In order that an equilibrium may obtain between the ſolid and fluid, we muſt have $B\times S=C\times s$: Now, when $s>S$, we have $B>C$, ſo that the ſolid will float, which is the ſecond caſe of Cor. 3.—When $S=s$ we have $B=C$, which is the third caſe of Cor. 3.—When $S>s$ we have $C>B$, that is, the body will ſink below the ſurface; and it will deſcend to the bottom, for it cannot be ſuſpended in the fluid without ſome power to ſupport it; and if ſuch a power were neceſſary, we ſhould have $B\times S>C\times s$, which is contrary to the equation of equilibrium.

84. From the equation $B\times S=C\times s$ we have (Euclid VI. 16.) $S:s=B:C$, which is Cor. 6.—When the body is completely immerſed we have $B=C$, in which caſe the equation becomes $B\times S=B\times s$; and when the ſolid is ſpecifically heavier than the fluid, it will require a counterweight to keep the ſolid ſuſpended in the fluid. Let W be the counterweight neceſſary for keeping the ſolid ſuſpended in the fluid, then in the caſe of an equilibrium the equation will be $B\times s+W=B\times S$, or $B\times S-W=B\times s$, or $S\times\overline{B\times S-W}=S\times B\times s$, whence (Euclid VI. 16.) $S:s=B\times S:B\times S-W$, which is Cor. 5.

85. If the ſame ſolid body is plunged in a ſecond fluid of a different ſpecific gravity from the firſt, let σ be the ſpecific gravity of the ſecond fluid, and w the counterweight neceſſary to keep the ſolid ſuſpended in it. The equation for the firſt fluid was $B\times s+W=B\times S$ (84.), and the equation for the ſecond fluid will be $B\times\sigma+w=B\times S$; therefore we ſhall have, by the firſt equation, $S\times B-W=s\times B$, and by the ſecond $S\times B-w=\sigma\times B$, and conſequently $s\times B:\sigma\times B=S\times B-W:S\times B-w$, or (Euclid V. 16.) $s:\sigma=S\times\overline{B-W}:S\times\overline{B-w}$, which is Cor. 4.; for the loſſes of weight in each fluid are evidently repreſented by $\overline{S\times B-W}$ and $\overline{S\times B-w}$.

86. If B and b expreſs the bulks of two ſolids, S and s their ſpecific gravities, σ the ſpecific gravity of the fluid, and W, w the counterweights which keep them in equilibrium with the fluid. Then with the ſolid S the equation will be $S\times B-W=\sigma\times B$ (85.); and with the ſolid s the equation will be $s\times b-w=\sigma\times b$. Wherefore, if the two ſolids ſuſtain equal loſſes of weight, we ſhall have $S\times B-W=s\times b-w$, ſince each ſide of the equation repreſents the loſs of weight ſuſtained by each ſolid reſpectively. Conſequently, $\sigma\times B=\sigma\times b$, and dividing by σ, we have $B=b$, which is corollary 7.

Method of detecting adulteration in metals.

87. From the preceding propoſition and its corollaries, we may deduce a method of detecting adulteration in the precious metals, and of reſolving the problem propoſed to Archimedes, by Hiero king of Syracuſe. Take a real guinea, and a counterfeit one made of copper and gold. If the latter be lighter than the former, when weighed in a pair of ſcales, the impoſition is inſtantly detected: But ſhould their weight be the ſame, let the two coins be weighed in water, and let the loſs of weight ſuſtained by each be carefully obſerved, it will then be found that the counterfeit will loſe more of its weight than the unadulterated coin. For, ſince the ſpecific gravity of copper exceeds that of gold, and ſince the abſolute weights of the coins were equal, the counterfeit guinea muſt be greater in bulk than the real one, and will therefore diſplace a greater quantity of water, that is (77.), it will loſe a greater part of its weight.

Problem propoſed by Hiero to Archimedes.

88. Hiero, king of Syracuſe, having employed a goldſmith to make him a crown of gold, ſuſpected that the metal had been adulterated, and inquired at Archimedes if his ſuſpicions could be verified or diſproved without injuring the crown. The particular method by which Archimedes detected the fraud of the goldſmith is not certainly known; but it is probable that he did it in the following manner. A quantity of gold, of the ſame abſolute weight as the crown, would evidently have the ſame bulk alſo, if the crown were pure gold, and would have a greater bulk if the crown were made

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made of adulterated gold. By weighing, therefore, the quantity of gold and the crown in water, and obſerving their reſpective loſſes of weight, Archimedes found that the crown loſt more of its weight than the quantity of gold; and therefore concluded, that as the crown muſt have diſplaced a greater portion of water than the piece of gold, its bulk muſt likewiſe have been greater, and the metal adulterated of which it was compared.

Prop. III.

89. If two immiſceable fluids, of different ſpecific gravities, and a ſolid of an intermediate ſpecific gravity, be put into a veſſel, the part of the ſolid in the lighter fluid will be to the whole ſolid, as the difference between the ſpecific gravities of the ſolid and the heavier fluid, is to the difference between the ſpecific gravities of the two fluids.

Fig. 5.

Let AB (fig. 5.) be the veſſel which contains the two fluids, ſuppoſe mercury and water, and the ſolid CD. The mercury being heavier than water will ſink to the bottom and have *m n* for its ſurface, and the water will occupy the ſpace AB*m n*. The ſolid having a greater ſpecific gravity than water, will ſink in the water (78.); but having a leſs ſpecific gravity than mercury, it will float in the mercury. It will, therefore, be ſuſpended in the fluids, having one portion C in the water, and the other portion D in the mercury. Now let S be the ſpecific gravity of the mercury, s the ſpecific gravity of the water, σ that of the ſolid, C the part of the ſolid in the water, and D the part in the mercury. Then the bulk of the ſolid is $C+D$, and its weight $\sigma\times\overline{C+D}$: The quantity of water diſplaced by the part C, or the loſs of weight ſuſtained by the part C, will be $C\times s$; and the quantity of mercury diſplaced, or the loſs of weight ſuſtained by part D, will be $D\times S$. But as the ſolid is ſuſpended in the fluids, and therefore in equilibrio with them, the whole of its weight is loſt. Conſequently, the part of its weight which is loſt in the water, added to the part loſt in the mercury, muſt be equal to its whole weight, that is, $\overline{C\times s}+\overline{D\times S}=\sigma\times\overline{C+D}$, or $sC+SD=\sigma C+\sigma D$. Tranſpoſing σC and SD, we have $sC-\sigma C=SD-\sigma D$, or $C\times\overline{s-\sigma}=D\times\overline{S-\sigma}$, and (Euclid VI. 16.) $C:D=\overline{s-\sigma}:\overline{S-\sigma}$. Then, by inverſion and compoſition (Euclid V. Propoſitions B and 18.) $C:\overline{C+D}=\overline{S-\sigma}:\overline{S-s}$. Q. E. D.

90. Cor. 1. From the analogy $C:D=\overline{s-\sigma}:\overline{S-\sigma}$, we learn that the part of the ſolid in the heavier fluid, is to the part in the lighter fluid, as the difference between the ſpecific gravities of the ſolid and the lighter fluid, is to the difference between the ſpecific gravities of the ſolid and the heavier fluid.

91. Cor. 2. When s is very ſmall compared with S, we may uſe the analogy $C:C+D=\sigma:s$, though in caſes where great accuracy is neceſſary this ought not to be done. When the ſpecific gravity of a body, lighter than water, is determined by comparing the part immerſed with the whole body, there is evidently a ſmall error in the reſult; for the body is ſuſpended partly in water and partly in air. It is in fact a ſolid of an intermediate ſpecific gravity floating in two immiſceable fluids, and therefore its ſpecific gravity ſhould be aſcertained by the preſent propoſition.

Prop. IV.

92. If two bodies, whether ſolid or fluid, be mixed together ſo as to form a compound ſubſtance, the bulk of the heavier is to the bulk of the lighter ingredient, as the difference between the ſpecific gravities of the compound, and the lighter ingredient, is to the difference between the ſpecific gravities of the compound and the heavier ingredient.

To find the bulk of the ingredients, their ſpecific gravities and that of the compound being given.

Let S and s be the ſpecific gravities of the two ingredients, σ the ſpecific gravity of the compound, and B, b the bulks of the ingredients; then the bulk of the compound will be $B+b$, and its weight $\sigma\times\overline{B+b}$. The weight of the ingredient B will be $B\times S$, and that of the other ingredient $b\times s$; and as the weight of the compound muſt be equal to the weight of its ingredients, we have the following equation. $\sigma b+\sigma B=BS+bs$, and by tranſpoſing σb and BS, we ſhall have $B\sigma-BS=bs-b\sigma$, or $B\times\overline{\sigma-S}=b\times\overline{s-\sigma}$; therefore (Euclid VI. 16.) $B:b=\overline{s-\sigma}:\overline{\sigma-S}$. Q.E.D.

A compound maſs whether ſolid or fluid, is ſometimes greater in bulk than the ſum of the bulks of its ingredients.

93. In the preceding propoſition, it has been taken for granted that the magnitude of the compound is exactly equal to the ſum of the magnitudes of the two ingredients. This, however, does not obtain univerſally either in fluids or ſolids; for an increaſe or diminution of bulk often attends the combination of two different ingredients. A cubical inch of alcohol, for example, combined with a cubical inch of water, will form a compound which will meaſure leſs than two cubical inches; and a cubical inch of tin, when incorporated in a fluid ſtate with a cubical inch of lead, will form a compound, whoſe bulk will exceed two cubical inches. The preceding propoſition, however, is, even in theſe caſes, of great uſe in aſcertaining the increaſe or decreaſe of bulk ſuſtained by the compound, by comparing the computed with the obſerved bulk. See *Specific Gravity*.

Prop. V. Problem.

94. How to determine the ſpecific gravities of bodies whether ſolid or fluid.

To determine the ſpecific gravities of ſolids and fluids.

The ſimpleſt and moſt natural way of finding the ſpecific gravities of bodies would be to take the abſolute weights of a cubic inch, or any other determinate quantity, of each ſubſtance; and the number thus found would be their ſpecific gravities. But as it is difficult to form two bodies of the very ſame ſize, and often impoſſible, as in the caſe of precious ſtones, to give a determinate form to the ſubſtance under examination, we are obliged to weigh them in a fluid, and deduce their ſpecific gravities from the loſſes of weight which they ſeverally ſuſtain. Water is the fluid which is always employed for this purpoſe, not only becauſe it can be had without difficulty, but becauſe it can be procured of the ſame temperature, and of the ſame denſity in every part of the world. The ſpecific gravity of water is always called 1 000, and with this, as a ſtandard, the ſpecific gravity of every other ſubſtance is compared. Thus, if

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a certain quantity of water weighed four pounds, and a ſimilar quantity of mercury 56 pounds, the ſpecific gravity of the mercury would be called 14, becauſe as 4 : 56 = 1 : 14. In order, therefore, to determine the denſities of bodies, we have occaſion for no other inſtrument than a common balance with a hook fixed beneath one of its ſcales. When fitted up in this way, it has been called the *hydroſtatic balance*, which has already been deſcribed under the article BALANCE, *Hydroſtatical*.

6

Hydroſtatic balance.

To find the ſpecific gravity of a ſolid heavier than water.

95. *When the ſubſtance is heavier than its bulk of water.* Suſpend the ſolid by means of a fine ſilver wire to the hook beneath the ſcale, and find its weight in air. Fill a jar with pure diſtilled water, of the temperature of 62° of Fahrenheit's thermometer, and find the weight of the ſolid when immerſed in this fluid. The difference of theſe weights is the loſs of weight ſuſtained by the ſolid. Then, (80.) as the loſs of weight is to the weight of the ſolid in air, ſo is 1.000 the ſpecific gravity of water to a fourth proportional, which will be the ſpecific gravity of the ſolid. But as the third term of the preceding analogy is always 1.000, the fourth proportional, or denſity of the ſolid, will always be had by dividing the weight of the ſolid in air by its loſs of weight in water. If the ſolid ſubſtance conſiſts of grains of platina or metallic filings, place it in a ſmall glaſs bucket. Find the weight of the bucket in air, when empty, and alſo its weight when it contains the ſubſtance. The difference of theſe weights will be the weight of the ſubſtance in air. Do the very ſame in water, and its weight in water will be had. Its ſpecific gravity will then be found as formerly.—If the body is ſoluble in water, or ſo porous as to abſorb it, it ſhould be covered with varniſh or ſome unctuous ſubſtance. When it is weighed in water, it ſhould never touch the ſides of the glaſs jar, and it muſt be carefully freed from any bubbles of air that happen to adhere to it.

To find the ſpecific gravity of a ſolid lighter than water.

96. *When the ſubſtance is lighter than its bulk of water.*—Faſten to it another ſolid heavier than water, ſo that they may ſink together. Find the weight of the denſer body, and alſo of the compound body, both in air and in water; and by ſubtracting their weight in water from their weight in air, find how much weight they have ſeverally loſt. Then ſay as the difference between their loſſes of weight is to the weight of the light body in air, ſo is 1.000 to the ſpecific gravity of the body.

To find the ſpecific gravity of powders.

97. *When the ſubſtance is a powder which abſorbs water, or is ſoluble in it.*—Place a glaſs phial in one ſcale, and counterpoiſe it by weights in the other. Fill this phial with the powder to be examined; and having rammed it as cloſe as poſſible to the very top, find the weight of the powder. Remove the powder from the phial, and fill it with diſtilled water and find its weight. The weight of the powder, divided by the weight of the water, will be the ſpecific gravity of the former.

To find the ſpecific gravity of fluids.

98. *When the ſubſtance is a fluid*, its ſpecific gravity may be determined very accurately by the method in the preceding article, or by the following method deduced from article 79.—Take any ſolid ſpecifically heavier than water, and the given fluid. Find the loſs of weight which it ſuſtains in water, and alſo in the given fluid. Then, ſince the ſpecific gravities are as the loſſes of weight ſuſtained by the ſame ſolid, the ſpecific gravity of the fluid required will be found by dividing the loſs of weight ſuſtained by the ſolid in the given fluid, by the loſs of weight which it ſuſtains in water.

SECT. II. *On the Hydrometer.*

Hydrometer invented by Hypathia.

99. In order to determine, with expedition, the ſtrength of ſpirituous liquors, which are inverſely proportional to their ſpecific gravities, an inſtrument more ſimple, though leſs accurate, than the hydroſtatic balance, has been generally employed. This inſtrument is called a *hydrometer*, ſometimes an *areometer* and *gravimeter*, and very erroneouſly a *hygrometer* by ſome foreign authors. It ſeems to have been invented by Hypathia, the daughter of Theon Alexandrinus, who flouriſhed about the end of the fourth century; though there is ſome foundation for the opinion that the invention is due to Archimedes.

Fahrenheit's hydrometer. Fig. 6.

100. The hydrometer of Fahrenheit, which is one of the ſimpleſt that has been conſtructed, is repreſented in fig. 6. and may be formed either of glaſs or metal. AB is a cylindrical ſtem, and C, D two hollow balls appended to it. Into the lower ball D is introduced a quantity of mercury, ſufficient to make the ball C ſink to F, a little below the ſurface of diſtilled water. If this apparatus be plunged into a fluid lighter than water, the ball C will ſink farther below the ſurface; and and if it be immerſed in a heavier fluid, it will riſe nearer the ſurface. In this way we can tell whether one fluid is more or leſs denſe than another. But in order to determine the real ſpecific gravities of the fluids, the hydrometer muſt either be loaded with different weights, or have a ſcale AB engraven on its ſtem. The former of theſe methods was employed by Fahrenheit. Having placed ſome ſmall weights on the top A, he marked any point E, to which the inſtrument ſunk in diſtilled water. By weighing the inſtrument thus loaded, he found the weight of a quantity of water equal to the part immerſed (76.) When the hydrometer was placed in a fluid denſer than water, he loaded it with additional weights till it ſunk to the ſame point E. The weight of the hydrometer being again found, gave him the weight of a quantity of the denſer fluid equal to the part immerſed; but as the part immerſed was the ſame in both caſes, the weights of the hydrometer were equal to the abſolute weights of equal quantities of the two fluids; and conſequently the ſpecific gravities of the water and the other fluid were in the ratio of theſe weights. When the fluid, whoſe denſity is required, has leſs ſpecific gravity than water, ſome of the weights are to be removed from the top A till the inſtrument ſinks to E; and the denſity of the fluid to be determined as before.—Inſtead of making the weight of the hydrometer variable, it is more ſimple, though leſs accurate, to have a ſcale of equal parts upon the ſtem AB. In order to graduate this ſcale, immerſe the hydrometer in diſtilled water, at the temperature of 60° Fahrenheit, ſo that it may ſink to B near the bottom of the ſtem, which may be eaſily effected, by diminiſhing or increaſing the quantity of mercury in the ball D. At B place the number 1.000, which ſhews that every fluid, in which the hydrometer ſinks to B, has its ſpecific gravity 1.000, or that of diſtilled water. The hydrometer is then to be plunged in another fluid leſs denſe than water, ſuppoſe oil, whoſe ſpecific gravity

Hydrometer with weights.

Hydrometer with an engraved ſcale.

Of Specific Gravities.

vity may be .900, and the point A marked, to which it sinks. Every fluid, therefore, in which the hydrometer sinks to A, has its specific gravity .900; and if the scale AB be divided into equal parts, every intermediate degree of specific gravity between .900 and 1.000 will be marked. If the scale AB be divided into four parts in the points E, F, G, the fluid in which the hydrometer sinks to G will have .975 for its specific gravity; the specific gravity of that in which it sinks to F will be .950, and so on with the other points of division. If it is required to extend the range of the instrument, and to make it indicate the densities of fluids specifically lighter than water, we have only to load it in such a manner as to make it sink to the middle of the scale F in distilled water; and by taking two fluids, between whose densities the specific gravity of every other fluid is contained, excepting mercury and metals in a fluid state, to determine, as before, the extremities of the scale.

Theorem for hydrometers in which the weight is variable. Fig. 6.

101. When the weight of the hydrometer is variable, let E be the point to which it sinks in two different fluids; and let W be the absolute weight necessary to make it sink to E in the denser fluid, and $W \pm p$ the weight necessary to make it sink to the same point in the lighter fluid. Let S, s be the specific gravities of the two fluids, and V the volume of the part of the hydrometer that is constantly immersed. Then (83.) $W = S \times V$, $W \pm p = s \times V$. From the first equation we have, $V = \frac{W}{S}$, and from the second equation $V = \frac{W \pm p}{s}$, consequently $\frac{W \pm p}{s} = \frac{W}{S}$, and by reduction $s = \frac{S \times \overline{W \pm p}}{W}$. Thus, by knowing W and the weight p, and also S the specific gravity of one of the fluids, which will be 1.000 if that fluid be water, we can find s the specific gravity of the other fluid.

Theorem for hydrometers in which the weight is constant.

102. When the weight of the hydrometer is constant, and the density of the fluid indicated by the depth to which it descends, let F, E be the points to which it sinks in two different fluids, whose specific gravities are S, s, W the absolute weight of the hydrometer, V the volume of the part immersed when the hydrometer has sunk to E, and v its volume when sunk to F. Then (83.), we have $W = S \times V$, and $W = s \times v$, consequently $s \times v = S \times V$, and $s = \frac{S \times V}{v}$. If the absolute weight W, therefore, of the hydrometer be known, and also the volumes V, v, and the specific gravity S of one of the fluids, which may be water, the specific gravity of the other fluid may be determined by the preceding formula. When the figure of the hydrometer is regular, the volumes V, v may be determined geometrically; but as the instrument is generally of an irregular form, the following method should be employed.

Description of various hydrometers.

103. The hydrometers of Clarke and Desaguliers differ so little from those which have now been described, that they are not entitled to a more particular description. The hydrometer invented by Mr William Jones of Holborn, is a simple and accurate instrument, and requires only three weights to discover the strengths of spirituous liquors from alcohol to water. Like other instruments of the same kind, it is adjusted to the temperature of 60° of Fahrenheit; but as every change of temperature produces a change in the specific gravity of the spirits, Mr Jones found it necessary to attach a thermometer to the instrument, and thus make a proper allowance for every variation of temperature. Almost all bodies expand with heat and contract with cold; and as their volume becomes different at different temperatures, their specific gravities must also (70.) be variable, and will diminish with an increase of temperature. M. Homberg, and M. Eisenschmed found that the absolute weight of a cubic inch of brandy was four drams 42 grains in winter, and only four drams 32 grains in summer, and that the difference in spirits of nitre was still greater. It has been found, indeed, upon an average, that 32 gallons of spirits in winter will expand to 33 gallons in summer. As the strength of spirituous liquors is inversely as their specific gravities, they will appear much stronger in summer than in winter. This change in their strength had been formerly estimated in a rough way; but by the application of the thermometer, and by adjusting its divisions experimentally, Mr Jones has reduced it to pretty accurate computation. It has already been stated (93.) that where two substances are combined, the magnitude of the compound body is sometimes greater and sometimes less than the sum of the magnitudes of the two ingredients, and that this mutual penetration particularly happened in the mixture of alcohol and water. In strong spirits, this concentration is sometimes so great, as to produce a diminution of four gallons in the 100; for if to 100 gallons of spirit of wine found by the hydrometer to be 66 gallons in the 100 over proof, you add 66 gallons of water to reduce it to proof, the mixture will consist only of 162 gallons instead of 166 of proof spirits. This mutual penetration of the particles of alcohol and water has also been considered in Mr Jones's hydrometer, which we shall now describe with greater minuteness.

Jones's hydrometer.

Plate CCLXV. Fig. 7.

104. In fig. 7. the whole instrument is represented with the thermometer attached to it. Its length AB is about $9\frac{1}{2}$ inches: the ball C is made of hard brass, and nearly oval, having its conjugate diameter about $1\frac{1}{2}$ inches. The stem AD is a parallelopiped, on the four sides of which the different strengths of spirits are engraved: the three sides which do not appear in fig. 7. are represented in fig. 8. with the three weights numbered 1, 2, 3, corresponding with the sides similarly marked at the top. If the instrument when placed in the spirits sinks to the divisions on the stem without a weight, their strength will be shewn on the side AD marked *o* at the top, and any degree of strength from 74 gallons in the 100 to 47 in the 100 above proof, will thus be indicated. If the hydrometer does not sink to the divisions without a weight, it must be loaded with any of the weights 1, 2, 3, till the ball C is completely immersed. If the weight N° 1 is necessary, the side marked 1 will show the strength of the spirits, from 46 to 13 gallons in the 100 above proof. If the weight N° 2 is employed, the corresponding side will indicate the remainder of overproof to *proof*, marked P in the instrument, and likewise every gallon in 100 under proof, down to 29. When the weight N° 3 is used, the side similarly marked will show any strength from 30 gallons in the 100 under proof, down to water, which is marked W in the scale. The small figures as 4 at 66, $3\frac{1}{2}$ at 61, $2\frac{1}{2}$ at 48 (fig. 7.) indicate the diminution of

Fig. 8.

Of Specific Gravities.

of bulk which takes place when water is mixed with ſpirits of wine in order to reduce it to proof: thus, if the ſpirit be 61 gallons in the 100 over proof, and if 61 gallons of water are added in order to render it proof, the magnitude of the mixture will be $3\frac{1}{2}$ gallons leſs than the ſum of the magnitudes of the ingredients, that is, inſtead of being 161 it will be only $157\frac{1}{2}$ gallons. The thermometer F connected with the hydrometer, has four columns engraved upon it, two on one ſide as ſeen in the figure, and two on the other ſide. When any of the ſcales upon the hydrometer, marked 0, 1, 2, 3 are employed, the column of the thermometer ſimilarly marked muſt be uſed, and the number at which the mercury ſtands carefully obſerved. The diviſions commence at the middle of each column which is marked *o*, and is equivalent to a temperature of 60 degrees of Fahrenheit; then, whatever number of diviſions the mercury ſtands above the zero of the ſcale, the ſame number of gallons in the 100 muſt the ſpirit be reckoned weaker than the hydrometer indicates, and whatever number of diviſions the mercury ſtands below the zero, ſo many gallons in the 180 muſt the ſpirit be reckoned ſtronger.

Dicas's hydrometer with a ſliding rule.

105. The patent hydrometer invented by Mr Dicas of Liverpool, poſſeſſes all the advantages of that which has now been deſcribed, but is ſuperior to it in regard to the accuracy with which it eſtimates the aberration ariſing from a change of temperature. It is conſtructed in the common form, with 36 different weights, which are valued from 0 to 370, including the diviſions on the ſtem; but the chief improvement conſiſts in an ivory ſliding rule which accompanies the inſtrument. In order to underſtand the conſtruction of this ſliding rule the reader muſt have recourſe to the inſtrument itſelf.

Quin's verſal hydrometer.

Plate CCLXV. Fig. 9.

106. Quin's univerſal hydrometer is conſtructed in ſuch a manner, as to aſcertain, with the greateſt expedition, the ſtrength of any ſpirit from alcohol to water, and alſo the concentration and ſpecific gravity of each different ſtrength. With the aſſiſtance of four weights, it diſcovers likewiſe the gravity of worts, and is therefore of more univerſal uſe than any other hydrometer. The inſtrument is repreſented in fig. 9. with the four ſides of its ſtem graduated and marked at the top ſo as to correſpond with the weights below. The ſide of the ſtem marked A. B, C, D, &c. to Z, ſhows the ſtrength of any ſpirit from alcohol to water, and the three other ſides numbered 1, 2, 3 are adapted for worts. The variation of denſity ariſing from the contraction and dilatation of the fluid is determined by means of a ſliding rule, differing very little from that of Mr Dicas. In order to uſe this inſtrument, place any of the weights, if neceſſary, on the ſtem at C; find the temperature of the ſpirit by a thermometer, and bring the ſtar on the ſliding rule to the degree of heat on the thermometer's ſcale: then oppoſite to the number of the weight and the letter on the ſtem, you have the ſtrength of the ſpirit pointed out on the ſliding rule, which is lettered and numbered in the ſame way as the inſtrument and weights. In aſcertaining the ſtrength of worts, the weight N° 4 is always to continue on the hydrometer, and the weights, N° 1, 2, 3, are adapted to the ſides N° 1, 2, 3, of the ſquare ſtem, which point out the exact gravity of the worts.

Nicholſon's hydrometer.

107. A conſiderable improvement on the hydrometer has lately been made by Mr Nicholſon, who has rendered it capable of aſcertaining the ſpecific gravities both of ſolids and fluids. In fig. 10. F is a hollow ball of copper attached to the diſh AA by a ſtem B, made of hardened ſteel. To the lower extremity of the ball is affixed a kind of iron ſtirrup FF, carrying another diſh G of ſuch a weight as to keep the ſtem vertical when the inſtrument is afloat. The parts of the hydrometer are ſo adjuſted, that when the lower diſh G is empty, and the upper diſh AA contains 1000 grains, it will ſink in diſtilled water at the temperature of 60° of Fahrenheit, ſo that the ſurface of the fluid may cut the ſtem DB at the point D. In order to meaſure the ſpecific gravities of fluids, let the weight of the inſtrument, when loaded, be accurately aſcertained. Then, this weight is equal to that of a quantity of diſtilled water at the temperature of 60°, having the ſame volume as that part of the inſtrument which is below the point D of the ſtem. If the hydrometer, therefore, is immerſed to the point D in any other fluid of the ſame temperature, which may be done by increaſing or diminiſhing the weights in the diſh AA, the difference between this laſt weight and 1000 grains will expreſs the difference between equal bulks of water and the other fluid. Now as the weight of the maſs of water is equal to the weight of the inſtrument, which may be called W, the above mentioned difference or D muſt be either added to or ſubtracted from W, (according as the weight in the diſh AA was increaſed or diminiſhed) in order to have the weight of an equal bulk of the fluid; then $W \pm D$ will be to W as the ſpecific gravity of the given fluid is to that of water. This ratio will be expreſſed with conſiderable accuracy, as the cylindrical ſtem of the inſtrument being no more than $\frac{1}{40}$ of an inch in diameter, will be elevated or depreſſed nearly an inch by the ſubtraction or addition of $\frac{1}{10}$ of a grain, and will, therefore, eaſily point out any changes of weight, not leſs than $\frac{1}{20}$ of a grain, or $\frac{1}{20000}$ of the whole, which will give the ſpecific gravities to five places of figures. The ſolid bodies whoſe ſpecific gravities are to be determined by this hydrometer, muſt not exceed 1000 grains in weight. For this purpoſe, immerſe the inſtrument in diſtilled water, and load the upper diſh till the ſurface of the water is on a level with the point D of the ſtem. Then, if the weight required to produce this equilibrium be exactly 1000 grains, the temperature of the water will be 60° of Fahrenheit; but if they be greater or leſs than 1000 grains, the water will be colder or warmer. After noting down the weight neceſſary for producing an equilibrium, unload the upper diſh, and place on it the body whoſe ſpecific gravity is required. Increaſe the weight in the upper diſh, till the inſtrument ſinks to the point D, and the difference between this new weight and the weight formerly noted down will be the weight of the body in air. Place the body in the lower diſh G, and add weights in the upper diſh till the hydrometer again ſinks to D. This weight will be the difference between 1000 grains and the weight of the body in water; and ſince the weight of the body in air, and its weight in water, are aſcertained, its loſs of weight will be known, and conſequently its ſpecific gravity (80.)

De Parcieux's areometer.

Plate CCLXVI. Fig. 6.

108. The areometer or hydrometer of M. De Parcieux conſiſts of a ſmall glaſs phial EG, about two inches in diameter

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Plate CCLXVI. Fig. 1.

diameter and seven inches long, having its bottom as flat as possible. The mouth is closed with a cork stopper, into which is inserted a straight iron or brass wire EF, about a line in diameter, and 30 inches long. When two fluids are to be compared, the bottle is loaded in such a manner by the introduction of small shot, that the instrument, when plunged in the lightest of the fluids, sinks so deep as to leave only the extremity of the wire above its surface, while in the heaviest fluid, the wire is some inches below the surface. The same effect may be produced by fixing a little dish F to the top of the wire, and varying the weights, or by altering the thickness of the wire. The areometer thus constructed, will indicate the smallest differences of specific gravity, and such minute variations of density, arising from a change of temperature, which would be imperceptible by any other hydrometer. The motion of an instrument of this kind, says Montucla, was so sensible, that when immersed in water of the usual temperature, it sunk several inches while the rays of the sun fell upon the water, and instantly rose when his rays were intercepted. In one of the areometers used by Deparcieux, an interval of six lines in the stem corresponded to a change of density about $\frac{1}{15048}$ of the whole. (*Mem. de l'Acad. Paris* 1766. p. 158.)

Wilson's hydrometer.

109. In order to determine the strength of spirits with the greatest expedition, Professor Wilson of Glasgow employed a very simple method. His hydrometer consists of a number of glass beads, the specific gravities of each of which vary in a known ratio. When the strength of any spirit is to be tried, the glass beads, which are all numbered, are to be thrown into it. Some of those whose specific gravity exceeds that of the spirit, will sink to the bottom, while others will swim on the top, or remain suspended in the fluid. That which neither sinks to the bottom nor swims on the surface, will indicate by its number the specific gravity of the spirits (78.)

Sect. III. *On Tables of Specific Gravities.*

Table of specific gravities.

110. As the knowledge of the specific gravities of bodies is of great use in all the branches of mechanical philosophy, we have given the following table collected by Mr Brewster, and published in his enlarged edition of Ferguson's Lectures, 2d edition. It comprehends the greater part of Brisson's tables, and is one of the most extensive that has yet been published. The names of the minerals, as given in Kirwan's Mineralogy, have in general been adopted; and such as have been discovered since the publication of that work will be found under the names by which they are designated in Professor Jameson's System of Oryctognosy. When the specific gravities of any substance, as determined by different authors, seem to be at variance, the different results are frequently given, and the names of the chemists prefixed by whom these results were obtained. The substances in the table have, contrary to the usual practice, been disposed in an alphabetical order. This was deemed more convenient for the purposes of reference, than if they had been divided into classes, or arranged according to the order of their densities.

111. Table of Specific Gravities.

A

Acacia, inspissated juice of,		1.5153
Acid, nitric,		1.2715
muriatic,		1.1940
red acetous,		1.0251
white acetous,		1.0135
distilled acetous,		1.0095
acetic,		1.0626
sulphuric,		1.8409
highly concentrated,		2.125
nitric, highly concentrated,		1.580
fluoric,		1.500
formic,		0.9942
phosphoric,		1.5575
citric,		1.0345
arsenic,		1.8731
of oranges,		1.0176
of gooseberries,		1.0581
of grapes,		1.0241
Actynolite, glassy,	*Kirwan.*	2.950 3.903
Æther, sulphuric,		0.7396
nitric,		0.9088
muriatic,		0.7296
acetic,		0.8664
Agate, oriental,		0.5901
onyx,		2.6375
speckled,		2.607
cloudy,		2.6253
Agate, stained,		2.6324
veined,		2.6667
Icelandic,		2.348
of Havre,		2.5881
Jaspèe,		2.6356
Herborisèe,		2.5891
Irisèe,		2.5535
Air, atmospheric,		
Barom. 29.75 Thermom. 32.		0.00122
Barom. 29.85 Thermom. 54°.5	*Lavoisier.*	0.0012308
Alabaster of Valencia,		2.638
veined,		2.691
of Piedmont,		2.693
of Malta,		2.699
yellow,		2.699
Spanish saline,		2.713
oriental white,		2.730
ditto, semi-transparent,		2.762
stained brown,		2.744
of Malaga pink,		2.8761
of Dalias,		2.6110
Alcohol, highly rectified,		0.8293
commercial,		0.8371
15 parts water 1 part		0.8527
14 2		0.8674
13 3		0.8815
12 4		0.8947
11 5		0.9075

Alcohol,

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Alcohol, 10 parts water 6		0.9199
9 7		0.9317
8 8		0.9427
7 9		0.9519
6 10		0.9594
5 11		0.9674
4 12		0.9733
3 13		0.9791
2 14		0.9852
1 15		0.9919
Alder wood,	*Muschenbroek.*	0.8000
Aloes, hepatic,		1.3586
socotrine		1.3795
Alouchi, odoriferous gum,		1.0604
Alumine, sulphate of,	*Muschenbroek.*	1.7140
saturated solution of, temp. 42°,	*Watson.*	1.033
Amber, yellow transparent,		1.0780
opaque,		1.0855
red,		1.0834
green,		1.0829
Ambergris,		0.7800 0.9263
Amethyst, common. See Rock crystal.		2.750
Amianthus, long,		0.9088
penetrated with water,		1.5662
short,		2.3134
penetrated with water,		3.3803
Amianthinite from Raschau,		2.584
Bayreuth,		2.916
Ammoniac, liquid,		0.8970
muriate of,	*Muschenbroek.*	1.4530
saturated solution of, temp. 42°,	*Watson.*	1.072
Andalusite, or hardspar,	*Häuy.*	3.165
Anime, oriental,		1.0284
occidental,		1.0426
Antimony, glass of,		4.9464
in a metallic state, fused,		6.624 6.860
native,	*Klaproth.*	6.720
sulphur of,		4.0643
Antimonial ore, gray and foliated,	*Kirwan.*	4.368
radiated,	*Kirwan.*	4.440
red,	*La Metherie.*	3.750
	Klaproth.	4.090
Apple tree,	*Muschenbroek.*	0.7930
Aquamarine. See Beryl.		
Arcanson,		1.0857
Areca, inspissated juice of,		1.4573
Arctizite, or wernerite,	*Dandrada.*	3.606
Argillite, or slate clay,	*Kirwan.*	2.600 2.680
Arnotto,		0.5956
Arragon spar,	*Häuy,*	2.946
Arsenic bloom, Pharmacolite,	*Klaproth.*	2.640
fused,	*Bergman.*	8.310
native,	*Kirwan.*	5.670
pyrites, common,	*Stiltz.*	4.791
	La Metherie.	5.600
	Brisson.	6.522
native, orpiment,		5.452
glass of, (arsenic of the shops),		3.5942
Asbestinite,	*Kirwan.*	3.000 3.310

Asbestos, mountain cork,	*Bergman.*	0.6806 0.9933
penetrated with water,		1.2492 1.3492
ripe,	*Brisson.*	2.5779
penetrated with water,		2.6994
starry,		3.0733
penetrated with water,		3.0808
unripe,		2.9958
penetrated with water,		3.0343
Ash trunk,	*Muschenbroek.*	0.8450
dry,	*Turin.*	0.800
Asphaltum, cohesive,		1.450 2.060
compact,		1.070 1.165
Assafœtida,		1.3275
Aventurine, semitransparent,		2.6667
opaque,		2.6426
Augite, octaedral basaltes,	*Häuy.*	3.226
	Werner.	3.471
	Reuss.	3.777
Azure stone, or lapis lazuli,	*Brisson.*	2.7675
	Kirwan.	2.896
oriental,		2.7714
of Siberia,		2.9454

B

Barolite, or witherite,		4.300 4.338
Baroselenite, or barytes,		4.400 4.865
white,		4.4300
grey,		4.4909
rhomboidal,		4.4434
octaedral,		4.4712
in stalactites,		4.2984
sulphate of, native,	*Kirwan.*	4.000 4.460
carbonate of, native,		4.300 4.338
Basaltes,	*Kirwan.*	2.979
	Bergman.	3.000
from the Giant's causeway,		2.864
prismatic from Auvergne,		2.4215
of St Tubery,		2.7948
Baras, a juice of the pine,		1.0441
Bay tree, Spanish,	*Muschenbroek.*	0.8220
Bdellium,		1.1377
Beech-wood,	*Muschenbroek.*	0.8520
Beer, red,		1.0338
white,		1.0231
Benzoin,		1.0924
Beryl, oriental aquamarine,		3.5491
occidental,		2.723
or aquamarine,	*Werner.*	2.650 2.759
schorlous, or shorlite,	*Häuy.*	3.514
Bezoar oriental,		1.666
occidental,		2.233
Bismuth, native,	*Kirwan.*	9.570
sulphurated,	*Kirwan.*	6.131
ochre,	*Brisson.*	4.371
in a metallic state, fused,		9.756 9.822

Bitumen,

Of Specific Gravities.

Bitumen, of Judea,		1.104
Black-coal, pitch coal,	*Wiedemann.*	1.308
ſlate coal, Engliſh,	*Kirwan.*	1.250
		1.370
Bielſchowitz,	*Richter.*	1.321
		1.382
cannel coal,	*La Metherie.*	1.270
Blende, yellow,	*Gellert.*	4.044
		4.048
brown, foliated,	*Gellert.*	3.770
		4.048
black,	*Gellert.*	3.930
	Briſſon.	4.166
auriferous from Nagyag,	*Von Muller.*	5.398
Blood, human,	*Jurin.*	1.054
craſſamentum of,	*Jurin.*	1.126
ſerum of,	*Jurin.*	1.030
Boles,	*Kirwan.*	1.400
		2.000
Bone of an ox,		1.656
Boracite,	*Weſtrumb.*	2.566
Borax,		1.714
ſaturated ſolution of, temp. 42°,	*Watſon.*	1.010
Bournonite,		5.576
Boxwood, French,	*Muſchenbroek.*	0.9120
Dutch,	*Muſchenbroek.*	1.3280
dry,	*Jurin.*	1.030
Braſs, common caſt,		7.824
wiredrawn,		8.544
caſt, not hammered,		8.396
Brazil wood, red,	*Muſchenbroek.*	1.0310
Brick,		2.000
Butter,		0.9423

C

Cacao butter,		0.8916
Cachibou, gum,		1.0640
Calamine,	*Briſſon.*	3.525
	La Metherie.	4.100
Calculus humanus,		1.700
		1.240
		1.434
Campechy wood, or logwood,	*Muſchenbroek.*	0.9130
Camphor,		0 9887
Caoutchouc, elaſtic gum, or India rubber,		0.9335
Caragna, reſin of the Mexican tree caragna,		1.1244
Carbon of compact earth,		1.3292
Carnelian, ſtalactite,		2.5977
ſpeckled,		2.6137
veined,		2.6234
onyx,		2.6227
pale,		2.6301
pointed,		2.6120
herborisèe,		2.6133
Cat's eye,	*Klaproth.*	2.600
		2.625
grey,		2.5675
yellow,		2.6573
blackiſh,		3.2593
Catchew, juice of an Indian tree,		1.3980
Cauſtic ammoniac, ſolution of, or fluid volatile alkali,		0.897
Cedar tree, American,	*Muſchenbroek.*	0.5608
Cedar, wild,	*Muſchenbroek.*	0.5608
Paleſtine,	*Muſchenbroek.*	0.5960
Indian,	*Muſchenbroek.*	1.3150
Celeſtine,	*Klaproth.*	3.830
foliated,		3.500
Ceylanite,	*Hauy.*	3.765
		3.793
Chalcedony, bluiſh,		2.5867
onyx,		2.6151
veined,		2.6059
tranſparent,		2.6640
reddiſh,		2.6645
common,	*Kirwan.*	2.600
		2.655
Chalk,	*Muſchenbroek.*	2.252
	Watſon.	2.657
Cherry-tree,	*Muſchenbroek.*	0.7150
Chryſoberyll,	*Werner.*	3.600
		3.720
	Häuy.	3.796
Chryſolite of the jewellers,	*Briſſon.*	2.782
of Braſil,		2.692
	Werner.	3.340
		3.410
Chryſopraſe,		2.489
		3.250
Chryſtal. See *Rock*.		
Chryſtalline lens,		1.100
Cinnabar, dark red, from Deux Ponts,	*Kirwan.*	7.786
from Almaden,	*Briſſon*	6.902
cryſtallized,	*Briſſon.*	10.218
Cinnamon, volatile oil of,		1.044
Citron tree,	*Muſchenbroek.*	0.7263
Clinkſtone,	*Klaproth.*	2.575
Cloves, volatile oil of,		1.036
Cobalt, in a metallic ſtate, fuſed,		7.645
		7.811
ore, gray,	*Häuy.*	5.511
		7.721
	Kirwan.	5.309
ochre, black, indurated,	*Gellert.*	2.019
		2.425
vitreous oxide of,		2.4405
Cocoa wood,	*Muſchenbroek.*	1.0403
Coccolite,	*Dandrada.*	3.316
Columbium,	*Hatchet.*	5.918
Copal, opaque,		1.1398
tranſparent,		1.0452
Madagaſcar,		1.0600
Chineſe,		1 0628
Copper, native,	*Kirwan.*	7.600
		7 800
from Siberia,	*Häuy.*	8.5084
Hungary,	*Gellert.*	7.728
ore, compact vireous,	*Kirwan.*	4.129
Corniſh,	*Kirwan.*	5.452
purple, from Bannat,	*Kirwan.*	4.956
from Lorraine,	*La Metherie.*	4.300
	Kirwan.	4.983
	Wiedemann.	5.467
pyrites,	*Kirwan.*	4.080
	Briſſon.	4.344
ore, white,	*La Metherie.*	4.500
gray,	*Häuy.*	4.865

Copper

Of Specific Gravities.

Copper ore, foliated, florid, red,	*Wiedemann.*	3.950
azure, radiated,	*Wiedemann.*	3.231
	Brisson.	3.608
emerald,	*La Metherie.*	2.850
	Häuy.	3.300
arseniate, of,		2.549
sulphate of, saturated solution of, temp. 42°,	*Watson.*	1.150
drawn into wire,		8.878
fused,		7.788
Copper-sand, muriate of copper,	*La Metherie.*	3.750
	Herrgen.	4.431
Cork,	*Muschenbroek.*	0.2400
Corundum of India,	*Klaproth.*	3.710
	Bournon.	3.875
of China,		3.981
Cross stone, or Staurolyte,	*Häuy.*	2.333
	Hever.	2.353
Cryolite,	*Karsten.*	2.957
Cube iron ore,	*Bournon.*	3.000
spar,	*Häuy.*	2.964
Cyanite,	*Saussure, jun.*	3.517
	Hermann.	3.622
Cyder,		1.0181
Cypress-wood, Spanish,	*Muschenbroek.*	0.6440
D		
Diamond oriental, colourless,		3.5212
rose-coloured,		3.5310
orange-coloured,		3.5500
green-coloured,		3.5238
blue-coloured,		3.5254
Brazilian,		3.4444
yellow,		3.5185
Dragons blood,		1.2045
E		
Ebony, Indian,	*Muschenbroek.*	1.2090
American,	*Muschenbroek.*	1.3310
Elder tree,	*Muschenbroek.*	0.6950
Elemi,		1.0182
Elm trunk,	*Muschenbroek.*	0.6710
Emerald,	*Werner.*	2.600
of Peru,	*Brisson.*	2.7755
	Häuy.	2.723
of Brasil,		3.1555
Euclase,	*Häuy,*	3.062
Euphorbium.		1.1244
F		
Fat of beef,		0.9232
veal,		0.9342
mutton,		0.9235
hogs,		0.9368
Felspar, fresh,	*Häuy.*	2.438
Adularia,	*Struve.*	2.500 / 2.600
Labrador stone,	*Brisson.*	2.607 / 2.704
glassy,		2.518 / 2.589
Filbert tree,	*Muschenbroek.*	0.6000
Fir, male,	*Muschenbroek.*	0.5500
female,	*Muschenbroek.*	0.4980
Fishes eye, name of a mineral,		2.5782

Flint,	*Blumenbach.*	2.594
olive,		2.6057
spotted,		2.5867
onyx,		2.6644
of Rennes,		2.6538
of England,		2.6087
variegated of Limosin,		2.2431
veined,		2.6122
Egyptian,		2.5648
black,		2.582
Fluor, white,		3.155
red,		3.191
green,		3.182
blue,		3.169
violet,		3.178
spar,		3.100 / 3.200
G		
Gadolinite,	*Häuy.*	4.050
Galbanum,		1.2120
Galena. See Lead Glance.		
Galipot, a juice of the pine,		1.0819
Gamboge,		1.2220
Garnet, precious of Bohemia,	*Klaproth.*	4.085
		4.188
	Werner.	4.230
	Kastner.	4.352
volcanic,		2.468
24 faces.		
of Syria,		4.000
in dodecahedral chrystals,		4.0637
common,	*Werner.*	3.576
	Kastner.	3.688
Gas, atmospheric. See Air.		
Gas, azotic, pure— Barom. 29.75		0.001146
Barom. 29.85, Therm. 54½	*Lavoisier.*	0.001189
oxygenous,		0.001305
	Davy.	0.001387
		0.001356
hydrogenous,		0.000099
	Lavoisier.	0.000095
	Dalton.	0.000123
carbonic acid,	*Brisson.*	0.001862
	Lavoisier.	0.001845
nitrous,		0.001411
Barom. 29.85, Therm. 54½	*Kirwan.*	0.001463
	Brisson.	0.001302
ammoniacal,		0.000706
	Brisson.	0.000654
Barom. 29.85, Therm. 54½	*Kirwan.*	0.000735
vapour, aqueous,	*Dalton.*	0.000862
	Saussure.	0.000874 / 0.000923
	Pictet.	0.000751
	Watt.	0.000825
sulphurous, Bar. 29.85, Ther. 54½	*Kirwan.*	0.001886 / 3.131
acid sulphurous,		0.002539
acid muriatic,		0.002135
Girasol,	*Brisson.*	4.000

Glance-coal,

Of Specific Gravities.

Glance-coal, slaty,	*Metherie.*	1.300
	Klaproth.	1.530
Glass, white flint,		3.00
crown,		2.520
common plate,		2.760
yellow plate,		2.520
white or French chrystal,		2.8922
St Gobins,		2.4882
gall,		2.8548
bottle,		2.7325
Leith crystal,		3.189
green,		2.6423
borax,		2.6070
fluid,		3.329
of Bohemia,		2.3959
of Cherbourg,		2.5596
of St Cloud,		3.2549
animal,		2.5647
mineral,		2.2694
Gold, pure, of 24 carats, fine, fused, but not hammered,		19.258
the same hammered,		19.342
English standard, 22 carats, fine, fused, but not hammered,		18.888
guinea of George II.		17.150
guinea of George III.		17.629
Parisian standard 22 carats, not hammered,		17.486
the same hammered,		17.589
Spanish gold coin,		17.655
Holland ducats,		19.352
trinket standard, 20 carats, not hammered,		15.709
the same hammered,		15.775
Portuguese coin,		17.9664
French money 21⅔ carats fused,		17.4022
coined,		7.6474
French in the reign of Louis XIII,		17.5531
Granite, red Egyptian,		2.6541
gray, Egyptian,		2.7279
beautiful red,		2.7609
of Girardmor.		2.7163
violet of Gyromagny,		2.6852
red of Dauphiny,		2.6431
green, ———		2.6836
radiated, ———		2.6678
red of Semur,		2.6384
gray of Bretagne,		2.7378
yellowish.		2.6136
of Carinthia, blue,	*Kirwan.*	2.9564
Granitelle,		3.0626
of Dauphiny,		2.8465
Graphic ore,	*Muller.*	5.723
Graphite. See Plumbago.		
Grenatite. See Staurotide.		
Gum Arabic,		1.4523
trajacanth,		1.3161
seraphic,		1.201
cherry tree,		1.4817
Bassora,		1.4346
Acajou,		1.4456
Monbain,		1.4206
Gutte,		1.2216
ammoniac,		1.2071
Gayac,		1.2289
Gum lac,		1.1390
animè d'orient,		1.0284
d'occident,		1.0426
Gunpowder in a loose heap,		0.836
shaken,		0.932
solid,		1.745
Gypsum, opaque,		2.1679
compact, specimen in the Leskean collection,		2.939
compact,		1.872 2.288
impure,		2.473
foliated, mixed with granular limestone,	*Kirwan.*	2.725
alabaster,	*Ward.*	1.872
semitransparent,		2.3062
fine ditto,		2.2741
opaque,		2.2642
rhomboidal,		2.3114
ditto, 10 faces,		2.3117
cuniform, chrystallised,		2.3060
striated of France,		2.3057
of China,		2.3088
flowered,		2.3059
spathic opaque,		2.2746
semitransparent,		3.3108
Gypsum, granularly foliated, in the Leskean collection,	*Kirwan.*	2.900
mixed with marl, of a slaty form,		2.473
H		
Hazel,	*Muschenbroek.*	0.606
Heavyspar, fresh, straight, lamellar,		4.300 4.500
columned,————not above		4.500
Heliotropium,	*Kirwan.*	2.629 2.700
	Blumenbach.	2.633
Hematites. See Ironstone.		
Hollow spar, Chiastolite,		2.944
Hone, Razor, white,		2.8763
penetrated with water,		2.8839
Razor white and black,		3.1271
Honey,		1.4500
Honeystone, or Mellilite,		1.586 1.666
Hornblende, common,	*Kirwan.*	3.600 3.830
resplendent, Labradore,	*Kirwan.*	3.350 3.434
Schiller spar,	*Kirwan.*	2.882
schistose,	*Kirwan.*	2.909 3.155
basaltic,	*Reuss.*	3.150 3.220
	Kirwan.	3.333
Hornstone, or Petrosilex,		2.530 2.653
ferruginous,		2.813
veined,		2.747
Hornstone, gray. See *Kirwan's Mineralogy,*		2.654
blackish gray,		2.744
yellowish white,		2.563
bluish, and partly yellowish gray,		2.626
dark purplish red iron shot,		2.638

Hornstone, greenish white, with reddish spots from Lorraine,		2.532
iron shot, brownish red, outside bluish, gray inside,		2.813
Hyalite,	*Kirwan.*	2.110
Hyacinth,	*Karsten.*	4.000
	Klaproth.	4.545 4.620
Hypocist,		1.5263

I

Jade, or Nephrite, white,		2.9592
green,		2.9660
olive,		2.9829
from the East Indies,	*Kirwan.*	2.977
of Swisserland,	*Brisson.*	3.310 3.389
combined with the boracic acid and boracited calx,		2.566
Jasmin, Spanish,	*Muschenbroek.*	0.7700
Jasper, veined,		2.6955
red,		2.6612
brown,		2.6911
yellow,		2.7101
violet,		2.7111
gray,		2.7640
cloudy,		2.7354
green,		2.6274
bright green,		2.3587
deep green,		2.6258
brownish green,		2.6814
blackish,		2.6719
blood coloured,		2.6277
heliotrope,		2.6330
onyx,		2.8160
flowered, red and white,		2.6228
red and yellow,		2.7500
green and yellow,		2.6839
red, green, and gray,		2.7323
red, green, and yellow,		2.7492
universal,		2.5630
agate,		2.6608
Jet, a bituminous substance,		1.2590
Indigo,		0.7690
penetrated with water,		1.0095
Inspissated juice of liquorice,		1.7228
Iridium, ore of, discovered by Mr Tennant,	*Wollaston.*	19.500
Iron, chromate of, from the department of Var,		4.0326
from the Ouralian mountains, in Siberia,	*Lauguier.*	4.0579
Sulphate of, saturated solution, temp. 42.	*Watson.*	1.157
fused, but not hammered,		7.200
forged into bars,		7.600 7.788
pyrites, dodecahedral,	*Hatchet.*	4.830
from Freyberg,	*Gellert.*	4.682
Cornwall,	*Kirwan.*	4.789
cubic,	*Brisson.*	4.702
radiated,	*Hatchet.*	4.698 4.775
sand, magnetic sand, from Virginia,		4.600
Iron ore specular,	*Kirwan.*	4.793 5.139
ore specular,	*Brisson.*	4.939 5.218
micaceous,	*Kirwan.*	4.728 5.070
Ironstone, red, ochrey,	*Wiedemann.*	2.952
compact,	*Kirwan.*	3.423
from Siberia,	*Kirwan.*	3.760
Lancashire,	*Brisson.* *Wiedemann.*	3.573 3.863
compact, brown, from Bayreuth,	*Kirwan.*	3.551
from Tyrol,	*Kirwan.*	3.753
cubic,	*Brisson.*	3.503 3.477
red hematites,	*Kirwan.*	5.005
	Gellert.	4.740
brown hematites,	*Kirwan.*	3.951
	Gellert.	3.789
	Wiedemann.	4.029
sparry, or calcareous,	*Kirwan.*	3.640 3.810
	Brisson.	3.672
decomposed,	*Kirwan.*	3.300 3.600
black, compact,	*Wiedemann.*	4.076
clay reddle,	*Brisson.*	3.139
	Blumenbach.	3.931
clay, lenticular,	*Kirwan.*	2.673
clay, common, from Cathina at Raschau,	*Kirwan.*	2.936
from Roscommon in Ireland,	*Rotheram.*	3.471
Carron in Scotland,	*Rotheram.*	3.205 3.357
clay, reniform iron ore,	*Wiedemann.*	2.574
clay, pea ore,	*Molinghof.*	5.207
Iron ore, lowland, from Sprottau,	*Kirwan.*	2.944
Iserine, a mineral from the Iser in Bohemia,		4.500
Juniper tree,	*Muschenbroek.*	0.5560
Ivory, dry,		1.8250
Ivy gum, from the hedera terrestris,		1.2948

K

Keffekil, or Meerschaum,	*Klaproth.*	1.6000
Kinkina,	*Muschenbroek.*	0.7840

L

Labdanum, resin,		1.1862
in tortis,		2.4933
Lapis nephriticus,		2.894
hæmatites		4.360
judaicus,		2.500
manatis,		2.270
hepaticus,		2.666
obsidianus,		2.348
lazuli. See Azure stone.		
Lard,		0.9478
Lavender, volatile oil of,		0.894
Lead glance, or galena, common,	*Gellert.*	7.290
from Derbyshire,	*Watson.*	6.565 7.786

Lead glance, compact,	*Gellert.*	6.886 7.444
	Kirwan.	4.319 5.052
chrystallized,	*Brisson.*	7.587
radiated,	*La Metherie.*	5.500
from the Hartz,	*Kirwan.*	7.448
Kautenbach,	*Vauquelin.*	6.140
Kirschwalder,	*Vauquelin.*	6.820
ore, corneous,	*Chenevix.*	6.065
reniform,	*Bindheim.*	3.920
of black lead,		6.745
blue,	*Gellert.*	5.461
brown,	*Wiedemann.*	6.974
from Huguelgoet,	*Klaproth.*	6.600
	Häuy.	6.909
black,	*Gellert.*	5.770
white from Leadhills,	*Chenevix.*	7.236
	Häuy.	6.559
phosphorated from Wanlock-head,	*Klaproth.*	6.560
Zschoppau,	*Klaproth.*	6.270
Brisgaw,	*Häuy.*	6.941
red; or red lead spar,	*Bindheim.*	5.750
	Brisson.	6.027
yellow, molybdenated,		5.092
Lead,	*Brisson.*	11.352
	Gellert.	11.445
acetite of,	*Muschenbroek.*	2.3953
vitriol from Anglesea,	*Klaproth.*	6.300
Lemon tree,	*Muschenbroek.*	0.7033
Lenticular ore (arseniate of copper),	*Bournon.*	2.882
Lepidolite, lilalite,	*Klaproth.*	2.816
	Häuy.	2.854
Leuzite,	*Klaproth.*	2.455 2.490
Lignum vitæ,	*Muschenbroek.*	1.3330
Limestone compact,		1.3864 2.7200
foliated,		2.710 2.837
granular,		2.700 2.800
green,		3.182
arenaceous,		2.742
white fluor,		3.156
calc. spar,		2.700
Linden, wood,	*Muschenbroek.*	0.604
Logwood, or Campechy wood,	*Muschenbroek.*	0.9130

M

Madder root,	*Muschenbroek.*	0.7650
Mahogany,		1.0630
Magnesia,	*Kirwan.*	2.3300
sulphate of, saturated solution, temp 42°	*Watson.*	1.232
Magnetic pyrites,	*Hatchet.*	4.518
ironstone,		4.200 4.939
Malachite,	*Brisson.*	3.572
compact,	*Brisson.*	3.641
	Muschenbroek.	3.994
Manganese,	*Bergman.*	6.850
	Hielm.	7.000
Manganese, gray ore of striated,	*Brisson.*	4.249 4.756
	Rinmann.	4.181
gray, foliated,	*Hagen.*	3.742
red from Kapnick,	*Kirwan.*	3.233
black,	*Dolomieu.*	2.0000 3.0000
	Brisson.	3.7076
penetrated with water,		3.9039
scaly,		4.1165
Maple wood,	*Muschenbroek.*	0.7550
Marble, Pyrenean,		2.726
black Biscayan,		2.695
Brocatelle,		2.650
Castilian,		2.700
Valencian,		2.710
Grenadian white,		2.705
Siennian,		2.678
Roman violet,		2.755
African,		2.708
Italian, violet,		2.858
Norwegian,		2.728
Siberian,		2.728
French,		2.649
Swisserland,		2.714
Egyptian, green,		2.668
yellow of Florence,		2.516
Mastic,		1.0742
tree,	*Muschenbroek.*	0.8490
Medlar tree,	*Muschenbroek.*	0.9440
Meerschaum. See Kessekil.		
Melanite, or black garnet.	*Karsten.*	3.691
	Werner.	3.800
Mellilite. See Honeystone,		
Menachanite,	*Lampadius.*	4.270
	Gregor.	4.427
Mercurial hepatic ore, compact,	*Kirwan.*	7.186 7.352
	Gellert.	7.937
Mercury at 32° of heat,		13.619
at 60°		13.580
at 212,		13.375
in a solid state, 40° below 0 Fahr.	*Biddle.*	15.612
in a fluid state, 47° above 0,	*Biddle.*	13.545
corrosive muriate of, saturated solution, temp. 42°	*Watson.*	1.037
natural calx of,		9.230
precipitate per se,		10.871
red,		8.399
mineralized by sulphur, native Ethiops. See also Cinnabar,	*Hahn.*	2.233
Mica, or glimmer,	*Brisson.*	2.791
	Blumenbach.	2.934
Milk, woman's,		1.0203
mare's,		1.0346
ass's,		1.0355
goat's,		1.0341
ewe's,		1.0409
cow's,		1.0324
Mineral from Cornwall, supposed to be zeolite, at 55° Fahrenheit,	*Gregor.*	2.253

Mineral pitch, elastic, or asphaltum,	*Hatchet.*	0.905
		1.233
	La Metherie.	0.930
Mineral tallow,		0.770
Molybdena in a metallic state, saturated with water,		7.500
native,	*Kirwan.*	4.048
	Shumacher.	4.667
	Brisson.	4.7385
Mountain crystal. See Rock Crystal.		
Mulberry tree, Spanish,	*Muschenbroek.*	0.8970
Muricalcite, crystallized, or rhomb spar,		2.480
Myrrh,		1.3600
N		
Naphtha,		0.8475
Nephrite. See Jade.		
Nickel in a metallic state,		7.421
		8.500
	Bergman.	9.3333
copper,	*Brisson.*	6.6086
		6.6481
	Gellert.	7.560
Nickel, ore of, called Kupfernickel of Saxe,		6.648
Kupfernickel of Bohemia,		6.607
sulphurated,		6.620
Nickeline, a metal discovered by Richter, cast,	*Richter.*	8.55
forged,	*Richter.*	8.60
Nigrine, or calcareo-siliceous titanic ore,	*Vauquelin.*	3.700
	Klaproth.	4.445
	Lowitz.	4.673
Nitre,	*Muschenbroek.*	1.9000
quadrangular,	*Muschenbroek.*	2.2460
saturated solution of, temperature 42°	*Watson.*	1.095
Novaculite, or Turkey hone. See Slate, Whet.		
O		
Oak, 60 years old, heart of,	*Muschenbroek.*	1.1700
Obsidian, or Icelandic agate. See Lapis Obsidianus.		
Octahedrite,	*Häuy.*	3.857
Oil of filberts,		0.916
walnut,		0.9227
hemp-seed,		0.9258
poppies,		0.9238
rape-seed,		0.9193
lint-seed,		0.9403
poppy-seed,		0.929
whale,		0.9233
ben, a tree in Arabia,		0.9119
beechmast,		0.9176
codfish,		0.9233
olives,		0.9153
almonds, sweet,		0.9170
volatile of mint, common,		0.8982
volatile of sage,		0.9016
thyme,		0.9023
rosemary,		0.9057
calamint,		0.9116
cochlearia,		0.9427
wormwood,		0.9073

Oil, volatile of, tansy,		0.9328
Stragan,		0.9949
Roman camomile,		0.8943
sabine,		0.9294
fennel,		0.9294
fennel-seed,		1.0083
coriander-seed,		0.8655
caraway-seed,		0.9049
dill-seed,		0.9128
anise-seed,		0.9867
juniper-seed,		0.8577
cloves,		1.0363
cinnamon,		1.0439
turpentine,		0.8697
amber,		0.8865
the flowers of orange,		0.8798
lavender,		0.8938
hyssop,		0.8892
Olibanum, gum,		1.1732
Olive tree,	*Muschenbroek.*	0.9270
copper ore foliated,	*Bournon.*	4.281
fibrous,	*Bournon.*	4.281
Olivine,	*Werner.*	3.225
Opal, precious,	*Blumenbach.*	2.114
common,	*Klaproth.*	1.958
		2.015
	Kirwan.	2.144
semiopal, reddish, from Telkobanya,	*Klaproth.*	2.540
ligniform, or wood,		2.600
Opium,		1.3365
Ophites. See Porphyry Hornblende.		
Opoponax,		1.6226
Orange tree,	*Muschenbroek.*	0.7059
Orpiment,	*Kirwan.*	3.048
		3.435
Orpiment, red. See Realgar.		
P		
Pear tree,	*Muschenbroek.*	0.6610
Pearls, oriental,		2.683
Peat, hard,		1.329
Peruvian bark,		0.7840
Petrol,		0.8783
Petrosilex. See Hornstone.		
Phosphorite, or Spargel stone, whitish, from Spain, before absorbing water,		2.8249
after absorbing water,		2.8648
greenish, from Spain,		3.098
Saxon,		3.218
Phosphorus,		1.714
Pierre de volvic,		2.320
Pinite,	*Kirwan.*	2.980
Pitch ore, or sulphurated uranite,	*Guyton.*	6.378
	Häuy.	6.530
	Klaproth.	7.500
Pitch-stone, black,	*Brisson.*	2.0499
yellow,	*Brisson.*	2.0860
red,	*Brisson.*	2.6695
brick, red, from Misnia,	*Kirwan.*	2.720
leek, green, inclining to olive,	*Kirwan.*	2.298
pearl gray,	*Kirwan.*	1.970
blackish,	*Brisson.*	2.3191

Pitch-stone,

Of Specific Gravities.

Pitch-ftone, olive,	*Briffon.*	2.3145
dark green,	*Briffon.*	2.3149
Pitchy, iron ore,		3.956
Platina drawn into wire,		21.0417
a wedge of, fent by Admiral Gravina to Mr Kirwan,		20.663
a bar of, fent by the king of Spain, to the king of Poland,		20.722
in grains purified by boiling in nitrous acid,		17.500 18.500
native,		15.601 17.200
fufed,		14.626
purified and forged,		20.336
compreffed by a flatting mill,		22.069
Plum tree,	*Mufchenbroek.*	0.7850
Plumbago, or graphite,	*Kirwan.*	1.987 2.267
Pomegranate tree,	*Mufchenbroek.*	1.3540
Poplar wood,	*Mufchenbroek.*	0.3830
white Spanifh,	*Mufchenbroek.*	0.5294
Porcelain from China,		2.3847
Seves, hard,		2.1457
tender,		2.1654
Saxony, modern,		2.4932
Limoges,		2.341
of Vienna,		2.5121
Saxony, called *Petite Jaune,*		2.5450
Porphyry, green,		2.6760
red,		2.7651
red of Dauphiny,		2.7933
red from Cordova,		2.7542
green from ditto,		2.7278
hornblende, or orphites,		2.9722
itch-ftone,		2.452
mullen,		2.600 2.728
fand-ftone,		2.564
Potafh, carbonate of,		1.4594
muriate of,	*Mufchenbroek.*	1.8365
tartrite of, acidulous,	*Mufchenbroek.*	1.9000
antimonial,		2.2460
fulphate of,		2.2980
Prafium,		2.5805
Prehnite of the Cape,	*Häuy.*	2.697
	Briffon.	2.9423
of France,	*Häuy.*	2.610
Proof fpirit, according to the Englifh excife laws,		0.916
Pumice ftone,		0.9145
Pyrites, coppery,		4.9539
cubical,		4.7016
ferruginous cubic,		3.900
ditto round,		4.101
ditto of St Domingo,		3.440
magnetic. *See* Magnetic Pyrites.		
Pyrope,	*Klaproth.*	3.718
	Werner.	3.941

Q

Quartz cryftallized, brown, red,		2.6468
brittle,		2.6404
gras,		2.6459
cryftallized,		2.6546
Quartz, milky,		2.652
elaftic,	*Gerhard.*	3.750
	Kirwan.	2.6240
Quince tree,	*Mufchenbroek.*	0.7050

R

Realgar, or red orpiment,	*Bergman.*	3.225
	Briffon.	3.338
Refin, or guiacum,		1.2289
of jalap,		1.2185
Rock or mountain cryftal from Madagafcar,		2.6530
clove brown,	*Karften.*	2.605
fnow white from Marmerofch,	*Karften.*	2.888
cryftal, European, pure, gelatinous,		2.6548
of Brafil,		2.6526
irifeè,		2.6497
rofe-coloured,		2.6701
yellow Bohemian,		2.6542
blue,		2.5818
violet, or amethyft,		2.6535
violet purple, or Carthaginian amethyft,		2.6570
pale violet, white amethyft,		2.6513
brown,		2.6534
black,		2.6536
Roucou,		0.5956
penetrated with water,		1.1450
Ruby oriental,		4.2833
Brazilian, or occidental,		3.5311
fpinell,		3.7600
	Klaproth.	3.5700
ballas,		3.6458
Rutile, or titanite,	*Häuy.*	4.102
	La Metherie.	4.246

S

Sahlite,	*Dandrada.*	3.234
Sal gemmæ,		2.143
Salt of vitriol,		1.9000
fedative of Homberg,		1.4797
polychreft,		2.1410
de Prunelle,		2.1480
volatile of hartfhorn,		1.4760
Sandarac,		1.0920
Santal, white,	*Mufchenbroek.*	1.0410
yellow,	*Mufchenbroek.*	0.8090
red,	*Mufchenbroek.*	1.1280
Sapagenum,		1.2008
Sapphire, oriental, white,		3.991
of Puys,		4.076
oriental,		3.994
Brazilian, or occidental,		3.1307
	uy.	3.994 4.283
	Hatchet. *Greville.*	4.000 4.083
Sarcocolla,		1.2684
Sardonyx, pure,	*Briffon.*	2.6025
pale,	*Briffon.*	2.6060
pointed,	*Briffon.*	2.6215
veined,	*Briffon.*	2.5951
onyx,	*Briffon.*	2.5949
herborifée,	*Briffon.*	2.5988
blackifh,	*Briffon.*	2.6284

Saffafras,

Sassafras,	*Muschenbroek.*	0.4820
Scammony, of Aleppo,		1.2354
Smyrna,		1.2743
Scapolite,	*Dandrada.*	{ 3.6800 / 8.7000
Schistus. *See* Slate, Hone, Stone.		
Schmelstein,	*Häuy.*	2.630
Schorl, black, prismatic, hexahedral,		3.3636
octahedral,		3.2265
enneahedral,		3.0926
black, sparry,		3.3852
amorphous, or ancient basaltes,		2.9225
cruciform,		3.2861
violet of Dauphiny,		3.2956
green,		3.4529
common,	*Brisson.*	3.092
	Gerhard.	3.150
	Kirwan.	3.212
tourmaline,	*Brisson.*	3.086
green,	*Häuy.*	3.362
blue,	*Werner.*	3.155
Selenite, or broad foliated gypsum,		2.322
Serpentine, opaque, green, Italian,		2.4295
penetrated with water,		2.4729
ditto, red and black veined,		2.6273
ditto, veined, black and olive,		2.5939
semitransparent, grained,		2.5859
ditto, fibrous,		2.9997
ditto, from Dauphiny,		2.6693
opaque, spotted black and white,		2.3767
spotted black and gray,		2.2645
spotted red and yellow,		2.6885
green from Grenada,		2.6849
deep green from Grenada,		2.7097
black, from Dauphiny, or Variolite,		2.9339
green from Dauphiny,		2.9883
green,		2.8960
yellow,		2.7305
violet,		2.6424
of Dauphiny,		2.7913
Siderocalcite, or brown spar,		2.837
Silver ore sulphurated,	*Brisson.*	6.910
	La Metherie.	7.200
brittle,	*Gellert.*	7.208
red,	*Brisson.*	5.564
light red,	*Brisson.*	5.5886
	Gellert.	5.443
sooty,	*Vauquelin.*	5.592
native, common,	*Gellert.*	10.000
	Selb.	10.333
antimonial,	*Häuy.*	9.4406
	Selb.	10.000
auriferous,	*Kirwan.*	10.600
ore, dark red,	*Gellert.*	5.684
	Brisson.	5.5637
arseniated, ferruginous,		2.178
penetrated with water,		2.340
ore, corneous, or horn ore,	*Brisson.*	4.7488
	Gellert.	4.804
virgin, 12 deniers, fine, not hammered,		10.474
12 deniers, hammered,		10.510
Paris standard, 11 deniers, 10 grains, fused,		10.175
hammered,		10.376

Silver shilling of George II.		10.000
George III.		10.534
French money, 10 deniers, 21 grains, fused,		10.048
French money, 10 deniers, 21 grains, coined,		10.408
Sinople, coarse jasper,		2.6913
Slate clay. *See* Argillite.		
common,		2.6718
or schistus, common,		2.6718
penetrated with water,		2.6905
whet, or novaculite,	*Kirwan.*	{ 0.722 / 2.609
Isabella, yellow,	*Kirwan.*	2.955
stone,		2.1861
fresh polished,		2.7664
adhesive,	*Klaproth.*	2.080
new,		2.8535
siliceous,	*Kirwan.*	{ 2.596 / 2.641
horn, or schistose porphyry,	*Kirwan.*	{ 2.512 / 2.700
Smalt, or blue glass of cobalt,		2.440
Soda, sulphate of,	*Muschenbroek.*	2.2460
muriate of,	*Muschenbroek.*	2.1250
saturated solution, temperature 42°,	*Watson.*	1.198
tartrite of, saturated solution of,	*Watson.*	1.114
fossil,		2.1430
saturation solution of, temperature 42°,	*Watson.*	1.054
Sommite, or nepheline,	*Häuy.*	3.2474
Spar, common,		{ 2.693 / 2.778
heavy,		4.430
brown. *See* Sidero-Calcite.		
rhomb. *See* Muricalcite.		
white sparkling,		2.5946
red ditto,		2.4378
green ditto,		2.7045
blue ditto,		2.6925
green and white do.		3.1051
transparent do.		2.5644
adamantine, or diamond,		3.873
schiller. *See* Horn-blende Labrador.		
fluor, white,		3.1555
red, or false ruby,		3.1911
octahedral,		3.1815
fluor, yellow, or false topaz,		3.0967
green, or false emerald,		3.1817
octahedral,		3.1838
blue, or false sapphire,		3.1688
greenish blue, or false aquamarine,		3.1820
violet, or false amethyst,		3.1757
violet, purple,		3.1857
English,		3.1796
of Auvergne,		3.0943
in stalactites,		3.1668
pearled,		2.8378
calcareous rhomboidal,		2.7151
of France,		2.7146
prismatic,		2.7182
and pyramidal,		2.7115

pyramidal,

pyramidal,		2.7141
(puant gris),		2.7121
(puant noir),		2.6207
or flos ferri,		2.6747
Spargel ſtone. *See* Phoſporite.		
Spermaceti,		9.9433
Spinelle,	*Klaproth.*	3.570
	Wiedemann.	3.700
Spirit of wine. *See* Alcohol.		
Spodumene,	*Häuy.*	1.192
	Dandrada.	3.218
Stalactite tranſparent,		2.3239
opaque,		2.4783
penetrated with water,		2.5462
Staurolite. *See* Croſs-ſtone.		
Staurotite, or grenatite,	*Häuy.*	3.286
Steatites of Bareight,		2.6149
penetrated with water,		2.6657
indurated,		2.5834
penetrated with water,		2.6322
Steel, ſoft,		7.8331
hammered,		7.8404
hardened in water,		7.8163
hammered and then hardened in water,		7.8180
St John's wort, inſpiſſated juice of,		1.5263
Strontian,	*Kirwan.*	3.400 / 3.644
	Klaproth.	3.675
Stone, ſand, paving,		2.4158
grinding,		2.1429
cutlers,		2.1113
Fountainbleau, glittering,		2.5616
cryſtallized,		2.6111
ſcythe of Auvergne, mean grained,		2.5638
fine grained,		2.6090
coarſe grained,		2.5686
Lorraine,		2.5298
Liege,		2.6356
mill,		2.4835
Briſtol,		2.510
Burford,		2.049
Portland,		2.496
rag,		2.470
rotten,		1.981
St Cloud,		2.201
St Maur,		2.034
Notre Dame,		2.378
Clicard from Brachet,		2.357
Ouchain,		2.274
rock of Chatillon,		2.122
hard paving,		2.460
Siberian blue,		2.945
touch,		2.415
priſmatic baſaltes,		2.722
of the quarry of Bourè,		1.3864
of Cherence,		2.4682
Storax,		1.1098
Sugar, white,	*Muſchenbroek.*	1.6060
Sulphur, native,		2.0332
fuſed,		1.9907
Sulphuric, or vitriolic acid,		1.841
Sulphurate, triple, of lead, antimony, and copper,	*Hatchet.*	5.766
Sylvanite, or tellurite, in a metallic ſtate, twice fuſed,		6.343
Sylvan, native,	*Jacquin, jun.*	4.107
	Muller.	5.723
	Klaproth.	6.115
ore, yellow,	*Muller.*	10.678
black,	*Jacquin, jun.*	6.157
	Muller.	8.919
Syringa,	*Muſchenbroek.*	1.0989

T

Tacamahaca, reſin,		1.0463
Talc, black crayon,		2.080
ditto German,		2.246
yellow,		2.655
white,		2.704
of mercury,		2.7917
black,		2.9004
earthy,		2.6325
common Venetian,		2.700 / 2.800
Tallow,		0.9419
Tantalite,	*Eckeberg.*	7.953
Tartar,	*Muſchenbroek.*	1.8490
Terra Japonica,		1.3980
Thumerſtone,	*Häuy.*	3.213 / 3.300
	Gerhard.	3.250
	Kirwan.	3.2956
Tin, pure, from Cornwall, fuſed,	*Watſon.*	7.170 / 7.291
fuſed and hammered,		7.291
of Malacca, fuſed		7.296
fuſed and hammered,		7.306
of Gallicia,	*Gellert.*	7.063
of Ehrenfriedenſdorf in Saxony,	*Gellert.*	7.271
pyrites,	*Klaproth.*	4.350
	LaMetherie.	4.785
ſtone,	*Gellert.*	6.300 / 6.989
	Brunich.	6.750
	Leyſſer.	6.880
black,	*Briſſon.*	6.901
red,	*Briſſon.*	6.9348
	Klaproth.	5.845 / 6.970
fibrous,	*Werner.*	7.000
	Brunich.	5.800
	Blumenbach.	6.450
new, fuſed,		7.3013
fuſed and hammered,		7.3115
fine, fuſed,		7.4789
fuſed and hammered,		7.5194
common,		7.9200
called *Claire-etoffe*,		8.4869
ore, Corniſh,	*Brunich.*	5.800
	Klaproth.	6.450
ſtone, white,		6.008
Titanite. *See* Rutile.		
Topaz, oriental,		4.0106
Brazilian,		3.5365
from Saxony,		3.5640
oriental piſtachio		4.0615
Saxony white,		3.5535
Tourmaline. *See* Shorl.		
Tungſten,	*Leyſſer.*	4.355

Of Specific Gravities.

Tungſten,	*Kirwan.*	5.800
		6.028
	Briſſon.	6.066
		6.015
	Klaproth.	5.570
Turbeth mineral,		8.235
Turpentine, ſpirits of		0.870
liquid,		0.991
Turquoiſe, ivory tinged by the blue calx of copper,		2.500
		2.908
U		
Ultramarine,	*Deſormes* and *Clement*,	2.360
Uran, *Mica*,	*Champeaux.*	3.1212
Uranite in a metallic ſtate,	*Klaproth.*	6.440
ſulphurated. *See* Pitch ore.		
Uranitic ochre indurated,	*La Metherie.*	3.150
	Häuy.	3.2438
Uranium, ſtone of,		7.500
Urine, human,		1.015
		1.026
V		
Vermeille, a kind of oriental ruby,		4.2299
Veſuviane,	*Wiedemann.*	3.575
	Klaproth.	3.420
of Siberia,	*Klaproth.*	3.365
		3.339
	Häuy.	3.407
Vine,	*Muſchenbroek.*	1.2370
Vinegar, red,	*Muſchenbroek.*	1.0251
white,		1.0135
Vitriol, Dantzic,		1.715
W.		
Walnut-tree of France,	*Muſchenbroek.*	0.6710
Water diſtilled at 32° temperature,		1.0000
ſea,		1.0263
of Dead ſea,		1.2403
wells		1.0017
of Bareges,		1.00037
of the Seine filtered,		1.00015
of Spa,		1.0009
of Armeil,		1.00046
Avray,		1.00043
Seltzer,		1.0035
Wavellite, or hydrarjillite,	*Davy.*	2.7000
Wax, Ourouchi,		9.8970
bees,		0.9648
Wax, white,		0.9686
ſhoemakers,		0.897
Whey, cows,		1.019
Willow,	*Muſchenbroek.*	0.5850
Witherite. *See* Barolite.		
Wine of Torrins, red,		0.9930
white,		0.9876
Champagne, white,		0.9979
Pakaret,		0.9997
Xeret,		0.9924
Malmſey of Madeira,		1.0382
Burgundy,		0.9915
Jurancon,		0.9932
Bourdeaux,		0.9939
Malaga,		1.0221
Conſtance,		1.0819
Wine of Tokay,		1.0538
Canary,		1.033
Port,		0.997
Wolfram,	*Gmelin.*	5.705
	Elhuyar.	6.835
	Leonhardi.	7.000
	Hatchet.	6.955
	Häuy.	7.333
Wolf's eye (name of a mineral),		2.3507
Woodſtone,		2.045
		2.675
Y		
Yew tree, Dutch,	*Muſchenbroek.*	0.7880
Spaniſh,	*Muſchenbroek.*	0.8070
Yttertantalite,	*Eckeberg.*	5.130
Z		
Zeolite from Edelfors, red, ſcintillant,		2.4868
white ſcintillant,		2.0739
compact,		2.1344
radiated,	*Häuy.*	2.083
cubic,	*Häuy.*	2.716
ſiliceous,		2.515
Zinc, pure and compreſſed,		7.1908
in its uſual ſtate,		6.862
formed by ſublimation and full of cavities,	*Kirwan.*	5.918
ſulphate of,	*Muſchenbroek.*	1.9000
ſaturated ſolution of, temp. 42°	*Watſon.*	1.386
Zircon, or jargon,	*Klaproth.*	4.615
	Karſten.	4.666
	Wiedemann.	4.700

Chap. III. *On Capillary Attraction, and the Coheſion of Fluids.*

Fluids do not riſe to the ſame level in a ſyſtem of communicating veſſels when their diameters are very minute.

112. We have already ſeen, when diſcuſſing the equilibrium of fluids, that when water or any other fluid is poured into a veſſel, or any number of communicating veſſels, its ſurface will be horizontal, or it will riſe to the ſame height in each veſſel, whatever be its form or poſition. This propoſition, however, only holds true when the diameter of theſe veſſels or tubes exceeds the fifteenth of an inch: for if a ſyſtem of communicating veſſels be compoſed of tubes of various diameters, the fluid will riſe to a level ſurface in all the tubes which exceed one-fifteenth of an inch in diameter; but in the tubes of a ſmaller bore, it will riſe above that level to altitudes inverſely proportional to the diameters of the tubes. The power by which the fluid is raiſed above its natural level is called *capillary attraction*, and the glaſs tubes which are employed to exhibit its phenomena are named *capillary tubes*. Theſe appellations derive their origin from the Latin word *capillus*, ſignifying a hair, either

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either becaufe the bores of thefe tubes have the finenefs of a hair, or becaufe that fubftance is itfelf fuppofed to be of a tubular ftructure.

112. When we bring a piece of clean glafs in contact with water or any other fluid, except mercury and fufed metals, and withdraw it gently from its furface, a portion of the fluid will not only adhere to the glafs, but a fmall force is neceffary to detach this glafs from the fluid mafs, which feems to refift any feparation of its parts. Hence it is obvious that there is an attraction of cohefion between glafs and water, and that the conftituent particles of water have alfo an attraction for each other. The fufpenfion of a drop of water from the lower fide of a plate of glafs is a more palpable illuftration of the firft of thefe truths; and the following experiment will completely verify the fecond. Place two large drops of water on a fmooth metallic furface, their diftance being about the tenth of an inch. With the point of a pin unite thefe drops by two parallel canals, and the drops will inftantly rufh to each other through thefe canals, and fill the dry fpace that intervenes. This experiment is exhibited in fig. 2. where AB is the metallic plate C, D the drops of water, and m, n the two canals.

There is an attraction of cohefion between glafs and water, and between the particles of water.

Plate CCLXVI. Fig. 2.

113. Upon thefe principles many attempts have been made to account for the elevation of water in capillary tubes; but all the explanations which have hitherto been offered, are founded upon hypothefis, and are very far from being fatisfactory. Without prefuming to fubftitute a better explanation in the room of thofe which have been already given, and fo frequently repeated, we fhall endeavour to illuftrate that explanation of the phenomena of capillary attraction which feems liable to the feweft objections. For this purpofe let E be a drop of water laid upon a clean glafs furface AB. Every particle of the glafs immediately below the drop E, exerts an attractive force upon the particles of water. This force will produce the fame effect upon the drop as a preffure in the oppofite direction, the preffure of a column of air, for inftance, on the upper furface of the drop. The effect of the attractive force, therefore, tending to prefs the drop to the glafs will be an enlargement of its fize, and the water will occupy the fpace FG; this increafe of its dimenfions will take place when the furface AB is held downwards; and that it does not arife from atmofpheric preffure may be fhown by performing the experiment *in vacuo*. Now let AB (fig. 2.) be a fection of the plate of glafs AB (fig. 3.) held vertically, part of the water will defcend by its gravity, and form a drop B, while a fmall film of the fluid will be fupported at m by the attraction of the glafs. Bring a fimilar plate of glafs CD into a pofition parallel to AB, and make them approach nearer and nearer each other. When the drops B and D come in contact, they will rufh together from their mutual attraction, and will fill the fpace op. The gravity of the drops B and D being thus diminifhed, the film of water at m and n which was prevented from rifing by their gravity will move upwards. As the plates of glafs continue to approximate, the fpace between them will fill with water, and the films at m and n being no longer prevented from yielding to the action of the glafs immediately below them (by the gravity of the water at op, which is diminifhed by the mutual action of the fluid particles) will rife higher in proportion to the approach of the plates. Hence it may be eafily underftood how the water rifes in capillary tubes, and how its altitude is inverfely as their internal diameters. For let A, a be the altitudes of the fluid in two tubes of different diameters D, d; and let C, c be the two cylinders of fluid which are raifed by virtue of the attraction of the glafs. Now, as the force which raifes the fluid muft be as the number of attracting particles, that is, as the furface of the tube in contact with the water, that is, as the diameter of the tubes, and as this fame force muft be proportional to its effects on the cylinder of water raifed, we fhall have $D : d = C : c$. But (GEOMETRY, Sect. VIII. Theor. XI. Sect. IX. Theor. II.) $C : c = D^2 A : d^2 a$, therefore $D^2 A : d^2 a = D : d$; hence $D^2 A\, d = d^2 a\, D$, and $DA = \frac{d^2 a D}{D d}$, or $DA = d a$, that is, $D : d = a : A$, or the altitudes of the water are inverfely as the diameters of the tubes. Since $DA = da$, the product of the diameter by the altitude of the water will always be a conftant quantity. In a tube whofe diameter is 0.01, or $\frac{1}{100}$ of an inch, the water has been found to reach the altitude of 5.3 inches; hence the conftant quantity $5.3 \times 0.1 = 0.053$ may fitly reprefent the attraction of glafs for water. According to the experiments of Mufchenbroek, the conftant quantity is 0.039; according to Weitbrecht 0.0428; according to Monge 0.042, and according to Atwood, 0.0530. When a glafs tube was immerfed in melted lead, Gellert found the depreffion multiplied by the bore to be 0.0054.

Attempt to account for the rife of water in capillary tubes. Fig. 2.

Fig. 3.

The altitudes of fluids in capillary tubes are inverfely as their diameters.

114. Having thus attempted to explain the caufes of capillary action, we fhall now proceed to confider fome of its moft interefting phenomena. In fig. 4. MN is a veffel of water in which tubes of various forms are immerfed. The water will rife in the tubes A, B, C to different altitudes m, n, o, inverfely proportional to their diameters. If the tube B is broken at a, the water will not rife to the very top of it at a, but will ftand at b, a little below the top, whatever be the length of the tube or the diameter of its bore. If the tube be taken from the fluid and laid in a horizontal pofition, the water will recede from the end that was immerfed. Thefe two facts feem to countenance the opinion of Dr Jurin * and other philofophers, that the water is elevated in the tube by the attraction of the annulus, or ring of glafs, *immediately above* the cylinder of water. This hypothefis is fufficiently plaufible; but fuppofing it to be true, the ring of glafs immediately below the furface of the cylinder of fluid fhould produce an equal and oppofite effect, and therefore the water inftead of rifing fhould be ftationary, being influenced by two forces of an equal and oppofite kind.

Phenomena of capillary attraction. Fig. 4.

Jurin's hypothefis.

* *Phil. Tranf.* No. 363. art. 2.

115. If a tube D compofed of two cylindrical tubes of different bores be immerfed in water with the wideft part downwards, the water will rife to the altitude p, and if another tube E of the fame fize and form be plunged in the fluid with the fmaller end downwards, the water will rife to the fame height q as it did in the tube D. This experiment feems to be a complete refutation of the opinion of Dr Jurin, that the water is raifed by the action of the annulus of glafs above the fluid column; for fince the annular furface is the fame at q as at p, the fame quantity of fluid ought to be fupported in both tubes, whereas the tube E evidently raifes

Phenomena of capillary attraction.

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raiſes much leſs water than D. But if we admit the ſuppoſition in art. 113. that the fluid is ſupported by the whole ſurface of glaſs in contact with the water, the phenomenon receives a complete explanation; for ſince the ſurface of glaſs in contact with the fluid in the tube E is much leſs than the ſurface in contact with it in the tube D, the quantity of fluid ſuſtained in the former ought to be much leſs than the quantity ſupported in the latter.

Phenomena of capillary attraction.

116. When a veſſel F*vw* is plunged in water, and the lower part *tuvw* filled by ſuction till the fluid enter the part F*t*, the water will riſe to the ſame height as it does in the capillary tube G, whoſe bore is equal to the bore of the part F*t*. In this experiment the portions of water *tvx* and *uxw* on each ſide of the column F*x* are ſupported by the preſſure of the atmoſphere on the ſurface of the water in the veſſel MM; for if this veſſel be placed in the exhauſted receiver of an air-pump, theſe portions of water will not be ſuſtained. Dr Jurin, indeed, maintains that theſe portions will retain their poſition *in vacuo*, but in his time the exhauſting power of the air-pump was not ſufficiently great to determine a point of ſo great nicety. The column *tux*, which is not ſuſtained by atmoſpherical preſſure, is kept in its poſition by the attraction of the water immediately around and above it, and the column F*tu* is ſupported by the attraction of the glaſs ſurface with which it is in contact. According to Dr Jurin's hypotheſis, the the column *tux* is ſupported by the ring of glaſs immediately above *r*, which is a very unlikely ſuppoſition.

Fig. 4.

Hypotheſis of Dr Hamilton and Dr Matthew Young.

117. The preceding experiment completely overturns the hypotheſis of Dr Hamilton, afterwards revived by Dr Matthew Young. Theſe philoſophers maintained that the fluid was ſuſtained in the tube by the lower ring of glaſs contiguous to the bottom of the tube, that this ring raiſes the portion of water immediately below it, and then other portions ſucceſſively till the portion of water thus raiſed be in equilibrium with the attraction of the annulus in queſtion. But if the elevation of the fluid were produced in this way, the quantity ſupported would be regulated by the form and magnitude of the orifice at the bottom of the tube; whereas it is evident from every experiment, that the cylinder of fluid ſuſtained in capillary tubes has no reference whatever to the form of the lower annulus, but depends ſolely upon the diameter of the tube immediately above the elevated column of water.

The capillary phenomena take place in the exhauſted receiver of an air-pump.

118. If the experiments which we have now explained be performed in the exhauſted receiver of an air-pump, the water will riſe to the ſame height as when they are performed in air. We may therefore conclude, that the aſcent of the water is not occaſioned, as ſome have imagined, by the preſſure of the atmoſphere acting more freely upon the ſurface of the water in the veſſel than upon the column of fluid in the capillary tube.

Experiments of Mr B. Martin on the aſcent of different fluids in capillary tubes.

119. It appears from the following table conſtructed by Mr B. Martin, that different fluids riſe to very different heights in capillary tubes, and that ſpirituous liquors whoſe ſpecific gravity is leſs than that of water, are not raiſed to the ſame altitude. Mr Martin's experiments were made with a tube about $\frac{1}{25}$ of an inch in diameter. He found that when capillary tubes charged with different fluids were ſuſpended in the ſun for months together, the encloſed fluid was not in the leaſt degree diminiſhed by evaporation.

Names of the Fluids.	Altit.	Conſtant Number.
Common ſpring water	*Inches* 1.2	.048
Spirit of urine	1.1	.044
Tincture of galls	1.1	.044
Recent urine	1.1	.044
Spirit of ſalt	0.9	.036
Ol. tart. per deliq.	0.9	.036
Vinegar	0.95	.038
Small beer	0.9	.036
Strong ſpirit of nitre	0.85	.034
Spirit of hartſhorn	0.85	.034
Cream	0.8	.032
Skimmed milk	0.8	.032
Aquafortis	0.75	.030
Red wine	0.75	.030
White wine	0.75	.030
Ale	0.75	.030
Ol. ſul. per campanam	0.65	.026
Oil of vitriol	0.65	.026
Sweet oil	0.6	.024
Oil of turpentine	0.55	.022
Geneva	0.55	.022
Rum	0.5	.020
Brandy	0.5	.020
White hard varniſh	0.5	.020
Spirit of wine	0.45	.018
Tincture of mars	0.45	.018

120. To the preceding table as given by Mr Martin we have added the conſtant number for each fluid, or the product of the altitude of the liquid, and the diameter of the tube (art. 113.). By this number therefore, we can find the altitude to which any of the preceding fluids will riſe in a tube of a given bore, or the diameter of the bore when the altitude of the fluid is known; for ſince the conſtant number $C = DA$ (art. 113.) we ſhall have $D = \frac{C}{A}$ and $A = \frac{C}{D}$. Since the conſtant number, however, as deduced from the experiments of Martin, may not be perfectly correct, it would be improper to derive from it the diameter of the capillary bore when great accuracy is neceſſary. The following method, therefore, may be adopted as the moſt correct that can be given. Put into the capillary tube a quantity of mercury, whoſe weight in troy grains is W, and let the length L of the tube which it occupies be accurately aſcertained; then if the mercury be pure and at the temperature of 60° of Fahrenheit, the diameter of the tube $D = \sqrt{\frac{W}{L}} \times 0.019241$, the ſpecific gravity of mercury being 13.580. The weight of a cubic inch of mercury being 3438 grains, and the ſolid content of the mercurial column being $D^2L \times 0.7854$, we ſhall have $1 : 3438 = D^2L \times 0.7854 : W$. Hence (Geometry, Sect. IV. Theor. VIII.) $D^2L \times 0.7854 \times 3438 = W$, and dividing we have $D^2 = \frac{W}{L \times 0.7854 \times 3438}$ or $D = \sqrt{\frac{W}{L \times 0.7854 \times 3438}}$, or $D = \sqrt{\frac{W}{L}} \times 0.019241$. If the whole tube be filled with mercury, and if W be the difference in troy grains between its weight when empty,

Method of meaſuring the internal diameter of a capillary tube.

empty, and when filled with mercury, the ſame theorem will ſerve for aſcertaining the diameter of the tube. Should the temperature of the mercury happen to be 32° of Fahrenheit, its ſpecific gravity will be 13.619, which will alter a very little the conſtant multiplier 0.019241.

The motion of water in capillary tubes accelerated by electricity and by heat.

121. When water is made to paſs through a capillary tube of ſuch a bore that the fluid is diſcharged only by ſucceſſive drops; the tube, when electrified, will furniſh a conſtant and accelerated ſtream, and the acceleration is proportional to the ſmallneſs of the bore. A ſimilar effect may be produced by employing warm water. Mr Leſlie found that a jet of warm water roſe to a much greater height than a jet of cold water, though the water in both caſes moved through the ſame aperture, and was influenced by the ſame preſſure. A ſyphon alſo which diſcharged cold water only by drops, yielded warm water in an invariable ſtream.

On the aſcent of fluids between two inclined plates of glaſs.

122. Such are the leading phenomena of capillary tubes. The riſe of fluids between two plates of glaſs remains to be conſidered; and while it furniſhes us with a very beautiful experiment, it confirms the reaſoning by which we have accounted for the elevation of fluids in cylindrical canals. Let ABEF and CDEF be two pieces of plate glaſs with ſmooth and clean ſurfaces, having their ſides EF joined together with wax, and and their ſides AB, CD kept a little diſtance by another piece of wax W, ſo that their interior ſurfaces, whoſe common interſection is the line EF, may form a ſmall angle. When this apparatus is immerſed in a veſſel MN full of water, the fluid will riſe in ſuch a manner between the glaſs planes as to form the curve DqomE, which repreſents the ſurface of the elevated water. By meaſuring the ordinates mn, op, &c. of this curve, and alſo its abſciſſæ Fn, Fp, &c. Mr Haukſbee found it to be the common Apollonian hyperbola, having for its aſſymptotes the ſurface DF of the fluid, and EF the common interſection of the two planes. To the very ſame concluſion we are led by the principles already laid down; for as the diſtance between the plates diminiſhes at every point of the curve DqomE from D towards E, the water ought to riſe higher at o than at q, ſtill higher at m, and higheſt of all at E, where the diſtance between the plates is a minimum. To illuſtrate this more clearly, let ABEF and CDEF be the ſame plates of glaſs, (inclined at a greater angle for the ſake of diſtinctneſs) and let EmqD, and EosB be the curves which bound the ſurface of the elevated fluid. Then, ſince the altitudes of the water in capillary tubes are inverſely as their diameters or the diſtances of their oppoſite ſides, the altitudes of the water between two glaſs plates, ſhould at any given point be inverſely as the diſtances of the plates at that point. Now, the diſtance of the plates at the point m is obviouſly mo, or its equal np, and the diſtance at q is qs or rt; and ſince mn is the altitude of the water at m, and qr its altitude at q, we have $mn : qr = np : rt$; but (GEOMETRY, Sect. IV. Theor. XVII.) Fn : Fr $= np : rt$; therefore $mn : qr =$ Fn : Fr, that is, the altitudes of the fluid at the points m, q, which are equal to the abſciſſæ Fn, Fr (fig. 5.) are proportional to the ordinates qr, mn, equal to Fn, Fr, in (fig. 5.). But in the Apollonian hyperbola the ordinates are inverſely proportional to their reſpective abſciſſæ, therefore the curve DqomE is the common hyperbola.—As the plates are infinitely near each other at the apex E, the water will evidently riſe to that point, whatever be the height of the plates.

Plate CCLXVI. Fig. 5.

Fig. 6.

Mercury deſcends in capillary tubes.

123. The phenomena which we have been endeavouring to explain, are all referable to one ſimple fact, that the particles of glaſs have a ſtronger attraction for the particles of water than the particles of water have for each other. This is the caſe with almoſt all other fluids except mercury, the particles of which have a ſtronger attraction for each other than for glaſs. When capillary tubes therefore are plunged in this fluid, a new ſeries of phenomena preſent themſelves to our conſideration. Let MN (fig. 7.) be a veſſel full of mercury. Plunge into the fluid the capillary tube CD, and the mercury, inſtead of riſing in the tube, will remain ſtationary at E, its depreſſion below the level ſurface AB being inverſely proportional to the diameter of the bore. This was formerly aſcribed to a repulſive force ſuppoſed to exiſt between mercury and glaſs, but we ſhall preſently ſee that it is owing to a very different cauſe.

Fig 7.

Mercury has a ſtronger attraction for its own particles than for glaſs.

124. That the particles of mercury have a very ſtrong attraction for each other, appears from the globular form which a ſmall portion of that fluid aſſumes, and from the reſiſtance which it oppoſes to any ſeparation of its parts. If a quantity of mercury is ſeparated into a number of minute parts, all theſe parts will be ſpherical; and if two of theſe ſpheres be brought into contact, they will inſtantly ruſh together, and form a ſingle drop of the ſame form. There is alſo a very ſmall degree of attraction exiſting between glaſs and mercury; for a globule of the latter very readily adheres to the lower ſurface of a plate of glaſs. Now ſuppoſe a drop of water laid upon a ſurface anointed with greaſe, to prevent the attraction of coheſion from reducing it to a film of fluid, this drop, if very ſmall, will be ſpherical. If its ſize is conſiderable, the gravity of its parts will make it ſpheroidal, and as the drop increaſes in magnitude, it will become more and more flattened at its poles, like AB in fig. 8. The drop however, will ſtill retain its convexity at the circumference, however oblate be the ſpheroid into which it is moulded by the force of gravity. Let two pieces of glaſs o A m, p B n, be now brought in contact with the circumference of the drop; the mutual attraction between the particles of water which enabled it to preſerve the convexity of its circumference, will yield to their ſuperior attraction for glaſs; the ſpaces m, n, o, p, will be immediately filled; and the water will riſe on the ſides of the glaſs, and the drop will have the appearance of AB in fig. 9. If the drop AB fig. 8. be now ſuppoſed mercury inſtead of water, it will alſo, by the gravity of its parts, aſſume the form of an oblate ſpheroid; but when the pieces of glaſs o A m, p B n are brought cloſe to its periphery, their attractive force upon the mercurial particles is not ſufficient to counteract the mutual attraction of theſe particles; the mercury therefore retains its convexity at the circumference, and aſſumes the form of AB in fig. 10. The ſmall ſpaces o, p being filled by the preſſure of the ſuperincumbent fluid, while the ſpaces m, n, ſtill remain between the glaſs and the mercury. Now if the two plates of glaſs A,B be made to approach each other, the depreſſions m, n will ſtill continue, and when the diſtance of the plates is ſo ſmall that theſe depreſſions or indentations meet, the mercury

Cauſe of the depreſſion of mercury in capillary tubes.

Fig. 8.

Fig. 9.

Fig. 10.

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will sink between the plates, and its descent will continue as the pieces of glass approach. Hence the depression of the mercury in capillary tubes becomes very intelligible.—If two glass planes forming a small angle, as in fig. 5. be immersed in a vessel of mercury, the fluid will sink below the surface of the mercury in the vessel, and form an Apollonian hyperbola like D *o* E, having for its assymptotes the common intersection of the planes and the surface of mercury in the vessel.

Fig. 5.

The depression of mercury in glass tubes, owing ultimately to an imperfect contact between the solid and the fluid.

125. The depression of mercury in capillary tubes is evidently owing to the greater attraction that subsists between the particles of mercury, than between the particles of mercury and those of glass. The difference between these two attractions, however, arises from an imperfect contact between the mercury and the capillary tube occasioned by the interposition of a thin coating of water which generally lines the interior surface of the tube, and weakens the mutual action of the glass and mercury; for this action always increases as the thickness of the interposed film is diminished by boiling. In the experiments which were made by Laplace and Lavoisier on barometers, by boiling the mercury in them for a long time, the convexity of the interior surface of the mercury was often made to disappear. They even succeeded in rendering it concave, but could always restore the convexity by introducing a drop of water into the tube. When the ebullition of the mercury is sufficiently strong to expel all foreign particles, it often rises to the level of the surrounding fluid, and the depression is even converted into an elevation.

Capillary attraction does not seem to act at any perceptible distance.

126. Newton, Clairaut, and other geometers, have maintained, that the action of the capillary tube is sensible at a small distance, and that it is extended to the particles of fluid in the axis of the tube. Laplace and other philosophers who have lately attended to this subject, suppose capillary attraction to be like the refractive force, and all the chemical affinities, which are not sensible except at imperceptible distances; and it must be allowed that this opinion is consistent with many of the phenomena. It has been often observed that water rises to the same height in glass tubes of the same bore, whether they be very thin or very thick. The zones of the glass tube therefore, which are at a small distance from the interior surface, do not contribute to the ascent of the water, though in each of these zones, taken separately, the water would rise above its level. When the interior surface of a capillary tube is lined with a very thin coating of an unctuous substance, the water will no longer ascend. Now if the attraction of the glass tube were similar to the attraction of gravity, of electricity, or magnetism, it ought to act through bodies of all kinds, and, notwithstanding the thin coating of grease, should elevate the fluid in which it is immersed. But as the intervention of an attenuated film of grease destroys capillary action, there is reason to conclude, that it does not extend to sensible distances. The same conclusion is deducible from the fact in the preceding paragraph.

Opinion of Laplace.

127. From these facts Laplace concludes, that the attraction of capillary tubes has not any influence on the elevation or depression of the fluids which they contain, except by determining the inclination of the first planes of the surface of the interior fluid, which are extremely near the sides of the tube. He supposes that when the attraction of the tube upon the fluid exceeds the attraction of the fluid upon itself, the fluid will in that case attach itself to the tube, and form an interior tube, which alone will raise the fluid.

128. 'It is interesting, says Laplace, to ascertain the radius of curvature of the surface of water included in capillary tubes of glass. This may be known by a curious experiment, which shews at the same time the effects of the concavity and convexity of surfaces. It consists in plunging in water, to a known depth, a capillary tube of which the diameter is likewise known. The lower extremity of the tube is then to be closed with the finger, and the tube being taken out of the water, its external surface must be gently wiped. Upon withdrawing the finger in this last situation, the water is seen to subside in the tube and form a drop at its lower base; but the height of the column is always greater than the elevation of the water in the tube above the level in the common experiment of plunging it in water. This excess in the height is owing to the action of the drop upon the column on account of its convexity; and it is observable that the increase in the elevation of the water is more considerable, the smaller the diameter of the drop beneath. The length of the fluid column which came out by subsidence to form the drop, determines its mass; and as its surface is spherical as well as that of the interior fluid, if we know the height of the fluid above the summit of the drop, and the distance of this summit from the plane of the interior bore of the tube, it will be easy to deduce the radii of these two surfaces. Some experiments lead me to conclude that the surface of the interior fluid approaches very nearly to the figure of an hemisphere.'

When a fluid is elevated or depressed between two parallel vertical planes, the planes tend to come together.

129. 'The theory which I have adopted, observes the same philosopher, likewise gives the explanation and measure of a singular phenomenon presented by experiment. Whether the fluid be elevated or depressed between two vertical planes, parallel to each other, and plunged in the fluid at their lower extremities, the planes tend to come together. Analysis shews us, that if the fluid be raised between them, each plane will undergo from without inwards a pressure equal to that of a column of the same fluid, of which the height would be half the sum of the elevations above the level of the points of contact of the interior and exterior surfaces of the fluid with the plane, and of which the base should be the parts of the plane comprised between the two horizontal lines drawn through those points. If the fluid be depressed between the planes, each of them will in like manner undergo from without inwards, a pressure equal to that of a column of the same fluid, of which the height would be half the sum of the depressions below the level of the points of contact of the interior and exterior surfaces of the fluid with the plane, and of which the base should be the part of the plane comprised between the two horizontal lines drawn through those points.'

Achard's experiments on the force necessary to raise the surface of a solid from the surface of water.

130. As most philosophers seem to agree in thinking that all the capillary phenomena are referable to the cohesive attraction of the superficial particles only of the fluid, a variety of experiments has been made in order to determine the force required to raise a horizontal solid surface from the surface of a fluid. Mr Achard found that a disc of glass, $1\frac{1}{2}$ French inches in diameter, required a weight of 91 French grains to raise it

Capillary Attraction, &c.

it from the ſurface of the water at 69° of Fahrenheit, which is only 37 Engliſh grains for each ſquare inch. At $44\frac{1}{2}$ of Fahrenheit the force was $\frac{1}{14}$ greater, or $39\frac{1}{2}$ grains, the difference being $\frac{1}{143}$ for each degree of Fahrenheit. From theſe experiments Dr Young concludes that the height of aſcent in a tube of a given bore, which varies in the duplicate ratio of the height of adheſion, is diminiſhed about $\frac{1}{180}$ for every degree of Fahrenheit that the temperature is raiſed above 50°; and he conjectures that there muſt have been ſome conſiderable ſource of error in Achard's experiments, as he never found this diminution to exceed $\frac{1}{1000}$. According to the experiments of Dutour, the force neceſſary to elevate the ſolid, or the quantity of water raiſed, is equal to 44.1 grains for every ſquare inch.

Morveau's experiments on the force neceſſary to raiſe metals from the ſurface of mercury.

131. According to the experiments of Morveau, the force neceſſary to elevate a circular inch of gold from the ſurface of mercury is 446 grains; a circular inch of ſilver, 429 grains; a circular inch of tin, 418 grains; a circular inch of lead, 397 grains; a circular inch of biſmuth 372 grains; a circular inch of zinc, 204 grains; a circular inch of copper, 142 grains; a circular inch of metallic antimony, 126; a circular inch of iron, 115 grains; and a ſimilar ſurface of cobalt required 8 grains. The order in which theſe metals are arranged is the very order in which they are moſt eaſily amalgamated with mercury.

On the apparent attraction of floating bodies.

132. The approach of two floating bodies has been aſcribed by ſome to their mutual attraction, and by others to the attraction of the portions of fluid that are raiſed round each by the attraction of coheſion. Dr Young, however, obſerves that the approach of the two floating bodies is produced by the exceſs of the atmoſpheric preſſure on the remote ſides of the ſolids, above its preſſure on their neighbouring ſides; or, if the experiments are performed in a vacuum, by the equivalent hydroſtatic preſſure or ſuction derived from the weight and immediate coheſion of the intervening fluid. This force varies alternately in the inverſe ratio of the ſquare of the diſtance; for when the two bodies approach each other, the altitude of the fluid between them is increaſed in the ſimple inverſe ratio of the diſtance; and the mean action, or the negative preſſure of the fluid on each particle of the ſurface, is alſo increaſed in the ſame ratio. When the floating bodies are ſurrounded by a depreſſion, the ſame law prevails, and its demonſtration is ſtill more ſimple and obvious.

Experiments of Count Rumford on the adheſion of fluids.

133. A number of experiments on the adheſion of fluids have been lately made by Count Rumford, which authoriſe him to conclude, that on account of the mutual adheſion of the particles of fluid, a pellicle or film is formed at the ſuperior and inferior ſurfaces of water, and that the force of the film to reſiſt the deſcent of bodies ſpecifically heavier than the fluid increaſes with the viſcidity of the water. He poured a ſtratum of ſulphuric ether upon a quantity of water, and introduced a variety of bodies ſpecifically heavier than water into this compound fluid. A ſewing needle, granulated tin, and ſmall globules of mercury, deſcended through the ether, but floated upon the ſurface of the water. When the eye was placed below the level of the aqueous ſurface, the floating body, which was a ſpherule of mercury, ſeemed ſuſpended in a kind of bag a little below the ſurface. When a larger ſpherule of mercury was employed, about the 40th or 50th of an inch in diameter, it broke the pellicle and deſcended to the bottom. The ſame reſults were obtained by uſing eſſential oil of turpentine or oil of olives inſtead of ether. When a ſtratum of alcohol was incumbent upon the water, a quantity of very fine powder of tin thrown upon its ſurface, deſcended to the very bottom, without ſeeming to have met with any reſiſtance from the film at the ſurface of the water. This unexpected reſult Count Rumford endeavours to explain by ſuppoſing that the aqueous film was deſtroyed by the chemical action of the alcohol. In order to aſcertain with greater accuracy the exiſtence of a pellicle at the ſurface of the water, Count Rumford employed a cylindrical glaſs veſſel 10 inches high and $1\frac{1}{2}$ inch in diameter, and filled it with water and ether as before. A number of ſmall bodies thrown into the veſſel deſcended through the ether, and floated on the ſurface of the water. When the whole was perfectly tranquil, he turned the cylinder three or four times round with conſiderable rapidity in a vertical poſition. The floating bodies turned round along with the glaſs, and ſtopped when it was ſtopped; but the liquid water below the ſurface did not at firſt begin to turn along with the glaſs; and its motion of rotation did not ceaſe with the motion of the veſſel. From this Count Rumford concludes that there was a real pellicle at the ſurface of the water, and that this pellicle was ſtrongly attached to the ſides of the glaſs, ſo as to move along with it. When this pellicle was touched by the point of a needle, all the ſmall bodies upon its ſurface trembled at the ſame time. The apparatus was allowed to ſtand till the ether had entirely evaporated, and when the pellicle was examined with a magnifier, it was in the ſame ſtate as formerly; and the floating bodies had the ſame relative poſitions.

134. In order to ſhew that a pellicle was formed at the inferior ſurface of water, Count Rumford poured water upon mercury, and upon that a ſtratum of ether. He threw into the veſſel a ſpherule of mercury about one-third of a line in diameter, which being too heavy to be ſupported by the pellicle at the ſuperior ſurface of the water, broke it, and deſcending through that fluid, was ſtopped at its inferior ſurface. When this ſpherule was moved, and even compreſſed with a feather, it ſtill preſerved its ſpherical from, and refuſed to mix with the maſs of mercury. When the viſcidity of the water was increaſed by the infuſion of gum arabic, much larger ſpherules were ſupported by the pellicle. From the very rapid evaporation of ether, and its inability to ſupport the lighteſt particles of a ſolid upon its ſurface, Count Rumford very juſtly concludes, that the mutual adheſion of its particles is very ſmall.

References to works on the coheſion of fluids.

135. Thoſe who wiſh to extend their inquiries concerning the coheſion of fluids, may conſult an ingenious paper on Capillary Action by Profeſſor Leſlie, in the Phil. Mag. for 1802; Dr Thomas Young's Eſſay on the Coheſion of Fluids, in the Phil. Tranſ. 1805.; an Abſtract of a Memoir of Laplace, in Nicholſon's Journal, N° 57.; and an Account of Rumford's Experiments, in the ſame Journal, N° 60, 61, and 62.

PART

PART II. HYDRAULICS.

Definition.

136. HYDRAULICS is that branch of the ſcience of hydrodynamics which relates to fluids in motion. It comprehends the theory of running water, whether iſſuing from orifices in reſervoirs by the preſſure of the ſuperincumbent maſs, or riſing perpendicularly in *jets d'eaux* from the preſſure of the atmoſphere; whether moving in pipes and canals, or rolling in the beds of rivers. It comprehends alſo the reſiſtance or the percuſſion of fluids, and the oſcillation of waves.

CHAP. I. *Theory of Fluids iſſuing from Orifices in Reſervoirs, either in a Lateral or a Vertical direction.*

Preliminary obſervations.

137. IF water iſſues from an orifice either in the bottom or ſide of a reſervoir, the ſurface of the fluid in the reſervoir is always horizontal till it reaches within a little of the bottom. When a veſſel therefore is emptying itſelf, the particles of the fluid deſcend in vertical lines, as is repreſented in fig. 1. but when they have reached within three or four inches of the orifice mn, the particles which are not immediately above it change the direction of their motion, and make for the orifice in directions of different degrees of obliquity. The velocities of theſe particles may be decompoſed into two others, one in a horizontal direction, by which they move parallel to the orifice, and the other in a vertical direction by which they approach that orifice. Now, as the particles about C and D move with greater obliquity than thoſe nearer E, their horizontal velocities muſt alſo be greater, and their vertical velocities leſs. But the particles near E move with ſo little obliquity that their vertical are much greater than their horizontal velocities, and very little leſs than their abſolute ones. The different particles of the fluid, therefore, will ruſh through the orifice mn with very different velocities, and in various directions, and will arrive at a certain diſtance from the orifice in different times. On account of the mutual adheſion of the fluid particles, however, thoſe which have the greateſt velocity drag the reſt along with them; and as the former move through the centre of the orifice, the breadth of the iſſuing column of fluid will be leſs at op than the width of the orifice mn.

Plate CCLXVII. Fig. 1.

Cauſe of the vena contracta,

138. That the preceding phenomena really exiſt when a veſſel of water is diſcharging its contents through an aperture, experience ſufficiently teſtifies. If ſome ſmall ſubſtances ſpecifically heavier than water be thrown into the fluid when the veſſel is emptying itſelf, they will at firſt deſcend vertically, and when they come within a few inches of the bottom they will deviate from this direction, and deſcribe oblique curves ſimilar to thoſe in the figure. The contraction of the vein or column of fluid at op is alſo manifeſt from obſervation. It was firſt diſcovered by Sir Iſaac Newton, and denominated the *vena contracta*. The greateſt contraction takes place at a point o whoſe diſtance from the orifice is equal to half its diameter, ſo that $om = \frac{mn}{2}$; and the breadth of the vein or column of fluid at o is to the width of the orifice as 5 to 8 according to Boſſut, or as 5.197 to 8 according to the experiments of Michelotti, the orifice being perforated in a thin plate. But when the water is made to iſſue through a ſhort cylindrical tube, the ſame contraction, though not obvious to the eye, is ſo conſiderable, that the diameter of the contracted vein is to that of the orifice as 6.5 to 8. If A therefore be the real ſize of the orifice in a thin plate, its corrected ſize, or the breadth of the contracted vein, will be $\frac{5.197 \times A}{8}$, and when a cylindrical tube is employed it will be $\frac{13 \times A}{16}$. In the firſt caſe the height of the water in the reſervoir muſt be reckoned from the ſurface of the fluid to the point o, where the vein ceaſes to contract; and when a cylindrical tube is employed, it muſt be reckoned from the ſame ſurface to the exterior aperture of the tube.

which was diſcovered by Newton.

Deſcription of the vena contracta.

Relation between the velocity of the fluid at the orifice, and that of the interior laminæ.

139. Suppoſe the fluid ABCD divided into an infinite number of equal *ſtrata* or *laminæ* by the horizontal ſurfaces MN, gh infinitely near each other; and let $mnop$ be a ſmall column of fluid which iſſues from the orifice in the ſame time that the ſurface MN deſcends to gh. The column $mnop$ is evidently equal to the lamina $MNgh$, for the quantity of fluid which is diſcharged during the time that MN deſcends to gh, is evidently $MNhg$; and to the quantity diſcharged in that time, the column $mnop$ was equal by hypotheſis. Let A be the area of the baſe MN, and B the area of the baſe mn; let x be the height of a column equal to $MNgh$, and having A for its baſe, and let y be the height of the column $mnop$. Then, ſince the column $mnop$ is equal to the lamina $MNgh$, we ſhall have $Ax = By$, and (GEOMETRY, Sect. IV. Theor. IX.) $x : y = A : B$; but as the ſurface MN deſcends to gh in the ſame time that mn deſcends to op, x will repreſent the mean velocity of the lamina $MNgh$, and y the mean velocity of the column $mnop$. The preceding analogy, therefore, informs us, that the mean velocity of any lamina is to the velocity of the fluid iſſuing from the orifice reciprocally as the area of the orifice is to the area of the baſe of the lamina $MNgh$. Hence it follows, that, if the area of the orifice is infinitely ſmall, with regard to the area of the baſe of the lamina into which the fluid is ſuppoſed to be divided, the mean velocity of the fluid at the orifice will be infinitely greater than that of the laminæ; that is, while the velocity at the orifice is finite, that of the laminæ will be infinitely ſmall.

140. Before applying theſe principles to the theory of hydraulics, it may be proper to obſerve, that ſeveral diſtinguiſhed philoſophers have founded the ſcience upon the ſame general law from which we have deduced the principles of hydroſtatics (32.). In this way they have repreſented the motion of fluids in general formulæ; but theſe formulæ are ſo complicated from the very

Motion of Fluids, &c. very nature of the theory, and the calculations are so intricate, and sometimes impracticable from their length, that they can afford no assistance to the practical engineer.

DEFINITION.

Fig. 1. 141. If the water issues at mn with the same velocity V that a heavy body would acquire by falling freely through a given height H, this velocity is said to be due to the height H, and inversely the height H is said to be due to the velocity V.

PROP. I.

142. The velocity of a fluid issuing from an infinitely small orifice in the bottom or side of a vessel, is equal to that which is due to the height of the surface of the fluid above that orifice, the vessel being supposed constantly full.

Fig. 2. Let AB be the vessel containing the fluid, its velocity when issuing from the aperture $m\,n$ will be that which is due to the height Dm, or equal to that which a heavy body would acquire by falling through that height. Because the orifice $m\,n$ is infinitely small, the velocity of the laminæ into which the fluid may be supposed to be divided, will also be infinitely small (art. 138.). But since all the fluid particles, by virtue of their gravity, have a tendency to descend with the same velocity; and since the different laminæ of the fluid lose this velocity, the column $m\,n\,s\,t$ must be pressed by the superincumbent column D$m\,n$; and calling S the specific gravity of the fluid, the moving force which pushes out the column $m\,n\,s\,t$ will be $S\times Dm\times m\,n$ (art. 42.). Now let us suppose, that, when this moving force is pushing out the column $m\,n\,s\,t$, the absolute weight of the column $m\,n\,o\,p$, which may be represented by $S\times m\,n\times np$, causes itself to fall through the height np. Thus, if V, U be the velocities impressed upon the columns $m\,n\,s\,t$, and $m\,n\,o\,p$ by the moving forces $S\times Dm\times mn$, and $S\times mn\times np$; these moving forces must be proportional to their effects, or to the quantities of motion which they produce, that is, to $V\times mnst$ and $U\times m\,n\,o\,p$, because the quantity of motion is equal to the velocity and mass conjointly; hence we shall have $S\times Dm\times mn : S\times m\,n\times np = V\times m\,n\,s\,t : U\times m\,n\,o\,p$. But since the volumes $m\,n\,s\,t$, $m\,n\,o\,p$ are to one another as their heights $m\,o$, $o\,s$, and as their heights are run through in equal times, and consequently represent the velocity of their motion, $m\,n\,s\,t$ may be represented by $V\times mn$ and $m\,n\,o\,p$ by $U\times mn$; therefore we shall have $S\times Dm\times mn : S\times mn\times np = V\times V\times mn : U\times U\times mn$, and dividing by mn, $S\times Dm : np = V^2 : U^2$. Now let v be the velocity due to the height Dm, then (see MECHANICS) $n\,p : U^2 = D\,m : v^2$; but since $S\times Dm : S\times np = V^2 : U^2$; then by (Euclid V. 15.), and by permutation $Dm : V^2 = np : U^2$, therefore by substitution (Euclid V. 11.) $Dm : V^2 = Dm : v^2$, and (Euclid V. 9.) $V^2 = v^2$ or $V = v$. But V is the velocity with which the fluid issues from the orifice $m\,n$, and v is the velocity due to the height Dm; therefore, since the velocities are equal, the proposition is demonstrated.

143. COR. 1. If the vessel AB empties itself by the small orifice $m\,n$, so that the surface of the fluid takes successively the positions DP, QR, ST, the velocities with which the water will issue when the surfaces have these positions will be those due to the heights En, Fn, Gn, for in these different positions the moving forces are the columns Emn, Fmn, Gmn.

144. COR. 2. Since the velocities of the issuing fluid when its surface is at E, F, G, are those due to the heights En, Fn, Gn, it follows from the properties of falling bodies (see MECHANICS), that if these velocities were continued uniformly, the fluid would run through spaces equal to 2 E n, 2 F n, 2 G n respectively, in the same time that a heavy body would fall through En, Fn, Gn, respectively.

145. COR. 3. As fluids press equally in all directions, the preceding proposition will hold true, when the orifices are at the sides of vessels, and when they are formed to throw the fluid upwards, either in a vertical or an inclined direction, provided that the orifices are in these several cases at an equal distance from the upper surface of the fluid. This corollary holds also in the case mentioned in Cor. 1.

146. COR. 4. When the fluid issues vertically, it will rise to a height equal to the perpendicular distance of the orifice from the surface of the fluid; for (see MECHANICS,) this is true of falling bodies in general, and must therefore be true in the case of water: owing to the resistance of the air, however, and the friction of the issuing fluid upon the sides of the orifice, jets of water do not exactly rise to this height.

147. COR. 5. As the velocities of falling bodies are as the square roots of the heights through which they fall (see MECHANICS), the velocity V of the effluent water when the surface is at E, will be to its velocity v when the surface is at G, as $\sqrt{En} : \sqrt{Gn}$, (Cor. 1.) that is, the velocities of fluids issuing from a very small orifice are as the square roots of the altitude of the water above these orifices. As the quantities of fluids discharged are as the velocities, they will also be as the square roots of the altitude of the fluid. This corollary holds true of fluids of different specific gravities, notwithstanding Belidor (*Architec. Hydraul.* tom. i. p. 187.) has maintained the contrary; for though a column of mercury D$m\,n$ presses with 14 times the force of a similar column of water, yet the column $m\,n\,o\,p$ of Fig. 2. mercury which is pushed out is also 14 times as heavy as a similar column of water; and as the resistance bears the same proportion to the moving force, the velocities must be equal.

148. COR. 6. When a vessel is emptying itself, if the area of the laminæ into which we may suppose it divided, be everywhere the same, the velocity with which the surface of the fluid descends, and also the velocity of efflux, will be uniformly retarded. For (art. 138.) as the velocity V with which the surface descends is to the velocity v at the orifice, as the area a of the orifice to the area A of the surface, then $V : v = a : A$; but the ratio of $a : A$ is constant, therefore V varies as v, that is, $V : V' = v : v'$; but, (Cor. 1.) $v : v' = \sqrt{h} : \sqrt{h'}$, h being the height of the surface above the orifice, therefore $V : V' = \sqrt{h} : \sqrt{h'}$. But this is the property of a body projected vertically from the earth's surface, and as the retarding force is uniform in the one case (see MECHANICS), it must also be uniform in the other.

149. COR. 7. If a cylindrical vessel be kept constantly full, twice the quantity contained in the vessel will run out during the time in which the vessel would have emptied.

Motion of Fluids, &c. Fig. 2. tied itself. For (Cor. 2. and 6.) the space through which the surface of the fluid at D would descend if its velocity continued uniform being $2\,D\,m$, double of $D\,m$ the space which it actually describes in the time it empties itself, the quantity discharged in the former case will also be double the quantity discharged in the latter: because the quantity discharged when the vessel is kept full, may be measured by what the descent of the surface would be, if it could descend with its first velocity.

Scholium.

150. The reader will probably be surprised when he finds in some of our elementary works on hydrostatics, that the velocity of the water at the orifice is only equal to that which a heavy body would acquire by falling through *half* the height of the fluid above the orifice. This was first maintained by Sir Isaac Newton, who found that the diameter of the *vena contracta* was to that of the orifice as 21 to 25. The area therefore of the one was to the area of the other as 21^2 to 25^2, which is nearly the ratio of 1 to $\sqrt{2}$. But by measuring the quantity of water discharged in a given time, and also the area of the *vena contracta*, Sir Isaac found that the velocity at the *vena contracta* was that which was due to the *whole* altitude of the fluid above the orifice. He therefore concluded, that since the velocity at the orifice was to that at the *vena contracta* as (H) $1:\sqrt{2}$, and in the latter velocity was that which was due to the whole altitude of the fluid, the former velocity, or that at the orifice, must be that which is due to only *half* that altitude, the velocities being as the square roots of the heights. Now the difference between this theory and that contained in the preceding proposition may be thus reconciled. The velocity found by the preceding proposition is evidently the vertical velocity of the filaments at E, which being immediately above the centre of the aperture $m\,n$ are not diverted from their course, and have therefore their vertical equal to their absolute velocity. But the vertical velocity of the particles between C and E, and E and D, is much less than their absolute velocity, on account of the obliquity of their motion, and also on account of their friction on the sides of the orifice. The mean vertical velocity, consequently, of the issuing fluid will be much less than the vertical velocity of the particles at E, that is, than the velocity found by the above proposition, or that due to the height $D\,m$. Now the velocity found by Sir Isaac Newton from measuring the quantity of water discharged, was evidently the mean velocity, which ought to be less than the velocity given by the preceding proposition, the two velocities being as $1:\sqrt{2}$ or as $1:1.414$. The theorem of Newton therefore may be considered as giving the mean velocity at the orifice, while our proposition gives the velocity of the particles at D, or the velocity at the *vena contracta*.

Fig. 2.

Prop. II.

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151. To find the quantity of water discharged from a very small orifice in the side or bottom of a reservoir, the time of discharge, and the altitude of the fluid, the vessel being kept constantly full, and any two of these quantities being given.

Let A be the area of the orifice $m\,n$; W the quantity of water discharged in the time T; H the constant height $D\,m$ of the water in the vessel, and let 16.087 feet be the height through which a heavy body descends in a second of time. Now, as the times of description are proportional to the square roots of the heights described, the time in which a heavy body will fall through the height H, will be found from the following analogy, $\sqrt{16.087}:\sqrt{H}=1:\frac{\sqrt{H}}{16.087}$, the time required. But as the velocity at the orifice is uniform, a column of fluid whose base is $m\,n$ and altitude $2H$ (Prop. I. Cor. 2.) will issue in the time $16.087\,\sqrt{H}$, or since A is the area of the orifice mn, $A\times 2H$ or $2HA$ will represent the column of fluid discharged in that time. Now since the quantities of fluid discharged in different times must be as the times of discharge, the velocity at the orifice being always the same, we shall have $\frac{\sqrt{H}}{16.087}:T=2HA:W$, and (Geometry, Sect. IV. Theor. VIII.) $\frac{W\sqrt{H}}{16.087}=2HAT$ or $W=\frac{2HAT\times 16087}{\sqrt{H}}$, and since $\frac{H}{\sqrt{H}}=\sqrt{H}$ we shall have $W=2AT\sqrt{H}\times 16.087$ Plate CCLXVII. Fig. 2.

an equation from which we deduce the following formulæ, which determine the quantity of water discharged, the time of discharge, the altitude of the fluid, and the area of the orifice, any three of these four quantities being given:

$$W=2AT\sqrt{H\times 16.087} \qquad A=\frac{W}{2T\sqrt{H\times 16.087}}$$

$$H=\frac{W^2}{4A^2T^2\times 16.087} \qquad T=\frac{W}{2A\sqrt{H=16.087}}$$

152. It is supposed in the preceding proposition that the orifice in the side of the vessel is so small that every part of it is equally distant from the surface of the fluid. But when the orifice is large like M (fig. 3.), the depths of different parts of the orifice below the surface of the fluid are very different, and consequently the preceding formulæ will not give very accurate results. Fig. 3.

(H) When a fluid runs through a conical tube kept continually full, the velocities of the fluid in different sections will be inversely as the area of the sections. For as the same quantity of fluid runs through every section in the same time, it is evident that the velocity must be greater in a smaller section, and as much greater as the section is smaller, otherwise the same quantity of water would not pass though each section in the same time. Now the area of the *vena contracta* is to the area of the orifice, as $1:\sqrt{2}$, therefore the velocity at the *vena contracta* must be to the velocity at the orifice as $\sqrt{2}:1$.

sults. If we suppose the orifice M divided into a number of smaller orifices a, b, c, it is evident that the water will issue at a, with a velocity due to the height Da, the water at b, with a velocity due to the height Eb, and the water at c, with a velocity due to the height Fc. When the whole orifice, therefore, is opened, the fluid will issue with different velocities at different parts of its section. Consequently, in order to find new formulæ expressing the quantity of water discharged, we must conceive the orifice to be divided into an infinite number of areas or portions by horizontal planes; and by considering each area as an orifice, and finding the quantity which it will discharge in a given time, the sum of all these quantities will be the quantity discharged by the whole orifice M.

Prop. III.

153. To find the quantity of water discharged by a rectangular orifice in the side of a vessel kept constantly full.

Plate CCLXVII. Let ABD be the vessel with the rectangular orifice GL, and let AB be the surface of the fluid. Draw the lines MNOP, $mnop$ infinitely near each other, and from any point D draw the perpendicular DC meeting the surface of the fluid in C. Then regarding the infinitely small rectangle MOmo as an orifice whose depth below the surface of the fluid is H, we shall have by the first of the preceding formulæ, the quantity of water discharged in the time T, or $W = T\sqrt{16.087} \times \sqrt{CN} \times \overline{2\,MO \times Nn}$, CN being equal to H and $\overline{MO \times Nn}$ to the area A. As the preceding formula represents the quantity of fluid discharged by each elementary rectangular orifice, into which the whole orifice GL is supposed to be divided, we must find the sum of all the quantities discharged in the time T, in order to have the total quantity afforded by the finite orifice in the same time. Upon DC as the principal axis, describe the parabola CHE, having its parameter P equal to 4 DC. Continue FG and DK to H and E. The area NPpn may be expressed by NP$\times$Nn. But (Conic Sections, Part I. Prop. X.) $\overline{NP}^2 = CN \times P$ (P being the parameter of the parabola) therefore $NP = \sqrt{CN \times P}$, and multiplying by Nn we have $NP \times Nn = Nn\sqrt{CN \times P}$, which expresses the area NPpn. Now this expression of the elementary area being multiplied by the constant quantity $T\sqrt{16.087} \times \frac{MO}{\sqrt{\frac{1}{4}P}}$ gives for a product $T\sqrt{16.087} \times \sqrt{CN} \times \overline{2MO \times Nn}$, for $\sqrt{\frac{1}{4}P} = \frac{1}{2}\sqrt{P}$ and $\frac{MO \times \sqrt{P}}{\frac{1}{2}\sqrt{P}} = 2\,MO$. But that product is the very same formula which expresses the quantity of water discharged in the time T by the orifice MOom. Therefore since the elementary area MPpm multiplied by the constant quantity $T\sqrt{16.087} \times \frac{MO}{\sqrt{\frac{1}{4}P}}$ gives the quantity of water discharged by the orifice MOom in a given time, and since the same may be proved of every other orifice of the same kind into which the whole orifice is supposed divided, we may conclude that the quantity of water discharged by the whole orifice GL will be found by multiplying the parabolic area FHED by the same constant quantity $T\sqrt{16.087} \times \frac{MO}{\sqrt{\frac{1}{4}P}}$. Now the area FHED is equal to the difference between the areas CDE and CFH. But (Conic Sections, Part I. Prop. X.) the area $CDE = \frac{2}{3}CD \times DE$; and since $P = 4CD$, and (Conic Sections, Part I. Prop. X.) $\overline{DE}^2 = CD \times P$ we have $\overline{DE}^2 = CD \times 4CD = 4\,CD^2$, that is $DE = 2CD$, then by substituting this value of DE in the expression of the area CDE, we have $CDE = \frac{4}{3}CD^2$. The area $CFH = \frac{2}{3}CF \times FH$, consequently the area $FHED = \frac{4}{3}CD^2 - \frac{2}{3}CF \times FH$, which multiplied by the constant quantity, gives for the quantity of water discharged, ($\frac{1}{3}P^2$ being substituted instead of its equal $\frac{4}{3}CD^2$,)

$$W = \frac{T\sqrt{16.087} \times MO \times \overline{\frac{1}{3}P^2 - \frac{2}{3}CF \times FH}}{\sqrt{\frac{1}{4}P}}.$$

But by the property of the parabola $FH^2 = CF \times P$ and $FH = \sqrt{CF \times P}$, therefore substituting this value of FH in the preceding formula, and also $\frac{1}{2}\sqrt{P}$ for its equal $\sqrt{\frac{1}{4}P}$, we have

$$W = \frac{T\sqrt{16.087} \times MO \times \overline{\frac{1}{3}P^2 - \frac{2}{3}CF \times \sqrt{CF \times P}}}{\frac{1}{2}\sqrt{P}}$$

and dividing by $\frac{1}{2}\sqrt{P}$ gives us

$$W = T\sqrt{16.087} \times MO \times \overline{\frac{2}{3}P\sqrt{P} - \frac{4}{3}CF \times \sqrt{CF}};$$

hence

$$T = \frac{W}{\sqrt{16.087} \times MO \times \overline{\frac{2}{3}P\sqrt{P} - \frac{4}{3}CF \times \sqrt{CF}}},$$

$$MO = \frac{W}{T\sqrt{16.087} \times \overline{\frac{2}{3}P\sqrt{P} - \frac{4}{3}CF \times \sqrt{CF}}},$$

$$P = \overline{\frac{9\,W}{4\,T\sqrt{16.087}} + 3CF\sqrt{CF}}\Big|^{\frac{2}{3}},$$

and since $P = 4CD$

$$CD = \overline{\frac{9\,W}{16\,T\sqrt{16.087}} + 12\,CF \times \sqrt{CF}}\Big|^{\frac{2}{3}}$$

$$CF = \overline{\frac{9\,W}{16\,T\sqrt{16.087}} + \frac{3}{8}P\sqrt{P}}\Big|^{\frac{2}{3}}$$

In these formulæ W represents the quantity of water discharged, T the time of discharge, MO the horizontal width of the rectangular orifice, P the parameter of the parabola $= 4CD$, CD the depth of the water in the vessel or the altitude of the water above the bottom of the orifice, and CF the altitude of the water above the top of the orifice. The vertical breadth of the orifice is equal to CD—CF.

154. Let x be the mean height of the fluid above the orifice, or the height due to a velocity, which if communicated to all the particles of the issuing fluid, would make the same quantity of water issue in the time T, as if all the particles moved with the different velocities due to their different depths below the surface, then by Prop. II. the quantity discharged or $W = 2T \times MO \times \overline{CD - CF} \times \sqrt{x \times 16.087}$, the area of the orifice being $MO \times \overline{CD - CF}$,

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$\times \overline{CD-CF}$, and by making this value of W equal to its value in the preceding article, we have the following equation.

$2T\times MO\times \overline{CD-CF}\times \sqrt{x}\times 16.087 = T\sqrt{16.087} \times MO\times \frac{2}{3}P\sqrt{P}-\frac{4}{3}CF\sqrt{CF}$, which by division and reduction, and the substitution of $\frac{1}{4}P$ instead of CD its equal, becomes

$$x=\frac{\frac{4}{9}(P\sqrt{P}-\frac{4}{1}CF\sqrt{CF})^2}{4(\frac{1}{4}P-CF)^2}.$$

Now this value of x is evidently different from the distance of the centre of gravity of the orifice from the surface of the fluid, for this distance is $\frac{CD+CF}{2}$ or $\frac{\frac{1}{4}P+CF}{2}$. But in proportion as CE increases, the other quantities remaining the same, the value of x will approach nearer the distance of the centre of gravity of the orifice from the surface of the fluid; for when CF becomes infinite, the parabolic arch CHE will become a straight line, and consequently the mean ordinate of the curve, which is represented by the mean velocity of the water, will pass through the middle of FD or the centre of gravity of the orifice.

Prop. IV.

155. To find the time in which a quantity of fluid equal to ABRT, will issue out of a small orifice in the side or bottom of the vessel AB, that is, the time in which the surface AB will descend to RT.

Plate CCLXVII. Fig. 5.

Draw DE, de at an infinitely small distance and parallel to AB. The lamina of fluid DdeE may be represented by $DE\times ob$; DE expressing the area of the surface. When the surface of the water has descended to DE, the quantity of fluid which will be discharged by an uniform velocity in the time T, will be $T\sqrt{16.087}\times 2A\times\sqrt{om}$, A being the area of the orifice, as in Prop. II. But as the variation in the velocity of the water will be infinitely small, when the surface descends from DE to de, its velocity may be regarded as uniform. The time, therefore, in which the surface describes the small height ob will be found by the following analogy; $T\sqrt{16.087}\times 2A\times\sqrt{om} : T = DE\times ob : \frac{DE\times ob}{\sqrt{16.087}\times 2A\times\sqrt{om}}$. Now as this formula expresses the time in which the surface descends from DE to de, and as the same may be shewn of every other elementary portion of the height CS, the sum of all these elementary times will give us the value of T, the time in which the surface AB falls down to RT. For this purpose, draw GP equal and parallel to Cn, and upon it as an axis, describe the parabola PVQ, having its parameter P equal to 4GP. Continue the lines AB, DE, de, RT, so as to form the ordinates HF, hf, UV, of the parabola. Upon GP as an axis describe a second curve, so that the ordinate GM may be equal to the area of the surface at AB, divided by the corresponding ordinate GQ of the parabola, and that the ordinate H may be the quotient of the area of the surface at DE divided by the ordinate HF. Now (Conic Sections, Part I. Prop. X.) $\overline{HF}^2 = HP\times P$ or $HF=\sqrt{HP}\times\sqrt{P}$, that is $\sqrt{HP} = \frac{HF}{\sqrt{P}}$; and since $om=HP$; $\frac{DE}{\sqrt{om}} = \frac{DE\times\sqrt{P}}{HF}$. But by the construction of the curve MN, we have $\frac{DE}{HF}=Hr$, consequently $\frac{DE}{\sqrt{om}}=Hr\times\sqrt{P}$. The elementary time therefore, expressed by $\frac{DE\times ob}{\sqrt{16.087}\times 2A\times\sqrt{om}}$ will, by the different substitutions now mentioned, be $\frac{Hr\times ob\sqrt{P}}{2A\sqrt{16.087}}$ or $\frac{\sqrt{P}}{2A\sqrt{16.087}}\times Hr\times ob$. But the factor $\frac{\sqrt{P}}{2A\sqrt{16.087}}$ consisting of constant quantities is itself constant, and the other factor $Hr\times ob$ represents the variable curvilineal area $Hrsh$. Now as the same may be shown of every other element of the time T, compared with the corresponding elements of the area GUtM, it follows that the time T required, will be found by multiplying the constant quantity $\frac{\sqrt{P}}{2A\sqrt{16.087}}$ by the curvilineal area GUtM; therefore $T=\frac{\sqrt{P}}{\sqrt{16.087}}\times\frac{GUtM}{2A}$, and the time in which the surface descends to mn, or in which the vessel empties itself, will be equal to $\frac{\sqrt{P}}{\sqrt{16.087}}\times\frac{GPNM}{2A}$.

Cor. The quantity of fluid discharged in the given time T may be found by measuring the contents of the vessel AB between the planes AB, and RT, the descent of the surface AB, viz. the depth CS, being known.

Prop. V.

156. To find the time in which a quantity of fluid equal to ABRT will issue out of a small orifice in the side or bottom of the *cylindrical* vessel AB, that is, the time in which the surface AB will descend to RT.

Plate CCLXVII. Fig. 6.

Let us suppose that a body ascends through the height mC with a velocity increasing in the same manner as if the vessel AB were inverted, and the body fell from m to C. The velocity of the ascending body at different points of its path being proportional to the square roots of the heights described, will be expressed by the ordinates of the parabola PVQ. The line DE being infinitely near to de, as soon as the body arrives at b it will describe the small space bo or hH in a portion of time infinitely small, with a velocity represented by the ordinate HF. Now the time in which the body will ascend through the space mC or its equal PG will be $\frac{\sqrt{PG}}{\sqrt{16.087}}$, because $\sqrt{16.087} : \sqrt{PG} = \frac{\sqrt{PG}}{\sqrt{16.087}}$ (See Mechanics); and if the velocity

impressed

impreſſed upon the body when at C were continued uniformly, it would run through a ſpace equal to 2GP or GQ in the time $\frac{\sqrt{PG}}{\sqrt{16.087}}$. But (DYNAMICS, 22.) the times of deſcription are as the ſpaces deſcribed directly, and the velocities inverſely, and therefore the time of deſcribing the ſpace 2GP or GQ uniformly, viz. the time $\frac{\sqrt{PG}}{\sqrt{16.087}}$ will be to the time of deſcribing the ſpace hH uniformly, as, $\frac{GQ}{GQ} : \frac{Hh}{HF}$, that is, as $\frac{GQ}{GQ}$ or $1 : \frac{\sqrt{PG}}{\sqrt{16.087}} = \frac{Hh}{HF} : \frac{\sqrt{PG}}{\sqrt{16.087}} \times \frac{Hh}{HF}$ the time in which the aſcending body will deſcribe Hh uniformly; but PG being equal to $\frac{1}{4}$P, the parameter of the parabola, we ſhall have $\sqrt{PG} = \sqrt{\frac{1}{4}P} = \frac{1}{2}\sqrt{P}$. Subſtituting this value of $\sqrt{PG}$ in the laſt formula, we ſhall have for the expreſſion of the time of deſcribing Hh uniformly $\frac{\frac{1}{2}\sqrt{P}}{\sqrt{16.087}} \times \frac{Hh}{HF}$. But by Prop. IV. the time in which the ſurface DH deſcends into the poſition dh, that is, in which it deſcribes Hh, is repreſented by $\frac{\sqrt{P}}{2A\sqrt{16.087}} \times Hr \times ob$ or $\frac{\sqrt{P}}{\sqrt{16.087}} \times \frac{Hr \times Hh}{2A}$. Therefore the time in which the aſcending body moves through hH, is to the time in which the deſcending ſurface moves through Hh as $\frac{\frac{1}{2}\sqrt{P}}{\sqrt{16.087}} \times \frac{Hh}{HF} : \frac{\sqrt{P}}{\sqrt{16.087}} \times \frac{Hr \times Hh}{2A}$, which expreſſions after being multiplied by 2, and after ſubſtituting in the latter $\frac{DE}{HF}$ inſtead of Hr, which is equal to it by conſtruction, will become $\frac{\sqrt{P}}{\sqrt{16.087}} \times \frac{Hh}{HF} : \frac{\sqrt{P}}{\sqrt{16.087}} \times \frac{DE \times Hh}{A \times HF}$, DE repreſenting, in this and in the following propoſition, the area of the ſurface of the fluid at D. Now, if we multiply the firſt of theſe expreſſions by DE, and the ſecond by A, we ſhall find the two products equal; conſequently (Euclid. VI. 16.) the firſt expreſſion is to the ſecond, or the time of the body's aſcent through hH is to the time of the ſurface's deſcent through Hh, as the area A of the orifice is to the area DE of the baſe of the cylindrical veſſel; and as the ſame may be demonſtrated of every elementary time in which the aſcending body and the deſcending ſurface deſcribe equal ſpaces, it follows that the whole time in which the aſcending body will deſcribe the height mC or PG, is to the whole time in which the ſurface AB will deſcend to mn, or in which the veſſel will empty itſelf, as the area A of the orifice is to the area of the ſurface DE, that is $A : DE = \sqrt{\frac{PG}{16.087}} : \sqrt{\frac{PG}{16.087}} \times \frac{DE}{A}$, the time in which the veſſel AB will empty itſelf. If RTmn be the veſſel, it may be ſhewn in the ſame manner, that the time in which it will empty itſelf will be $\sqrt{\frac{PU}{16.087}} \times \frac{DE}{A}$, DE being equal to RT. But the difference between the time in which the veſſel ABmn empties itſelf, and the time in which the veſſel RTmn empties itſelf, will be equal to the time required in the propoſition, during which the ſurface AB deſcends to RT. This time therefore will be

$$T = \sqrt{\frac{PG}{16.087}} \times \frac{DE}{A} - \sqrt{\frac{PU}{16.087}} \times \frac{DE}{A} = \frac{DE\sqrt{PG} - DE\sqrt{PU}}{A\sqrt{16.087}}$$

$$T = \frac{DE \times \overline{\sqrt{PG} - \sqrt{PU}}}{A\sqrt{16.087}}. \text{ Hence}$$

$$PU = \left(\frac{T, A\sqrt{16.087}}{DE} - \sqrt{PG}\right)^2$$

$$PG = \left(\frac{T, A\sqrt{16.087}}{DE} + \sqrt{PU}\right)^2$$

$$PG - PU \text{ or } UG = \frac{2T, A \times DE\sqrt{PG \times 16.087} - T^2A^2 \times 16.087}{DE^2}$$

As the quantity of fluid diſcharged while the ſurface AB deſcends to RT is equal to DE × UG, we ſhall have

$$W = DE \times \frac{2T, A \times DE\sqrt{PG \times 16.087} - T^2A^2 \times 16.087}{DE^2}$$

$$A = \frac{DE \times \sqrt{PG} \times \sqrt{PU}}{T\sqrt{16.087}}$$

$$DE = \frac{T, A\sqrt{16.087}}{\sqrt{PG} - \sqrt{PU}}$$

Prop. VI.

157. If two cylindrical veſſels are filled with water, the time in which their ſurfaces will deſcend through ſimilar heights will be in the compound ratio of their baſes, and the difference between the ſquare roots of the altitudes of each ſurface at the beginning and end of its motion, directly, and the area of the orifices inverſely.

Figs. 6. and 7.

Let $ABmn$, $A'B'm'$, n' be the two veſſels; then by the laſt propoſition, the time T, in which the ſurface AB of the firſt deſcends to RT, will be to the time T′ in which the ſurface A′B′ of the ſecond deſcends to R′T′ as $\frac{DE \times \overline{\sqrt{PG} \times \sqrt{PU}}}{A\sqrt{16.087}}$ to $\frac{D'E' \times \overline{\sqrt{P'G'} - \sqrt{P'U'}}}{A'\sqrt{16.087}}$,

or, by dividing by $\sqrt{16.087}$, as $\frac{DE \times \overline{\sqrt{PG} - \sqrt{PU}}}{A}$

to $\frac{D'E' \times \overline{\sqrt{PG} - \sqrt{PU}}}{A}$. Q.E.D.

158. Cor. Hence the time in which two cylindrical veſſels full of water will empty themſelves, will be in the compound ratio of their baſes and the ſquare roots of their altitudes directly, and the area of the orifices inverſely; for in this time the ſurfaces AB, A′B′ deſcend to mn, $m'n'$ reſpectively, and therefore $\sqrt{\overline{PG} - PU} = \sqrt{PG}$; ſince PU vaniſhes, the times will be as $\frac{DE \times \sqrt{PG}}{A}$ to $\frac{D'E' \times \sqrt{P'G'}}{A'}$.

Prop. VII.

159. To explain the theory and conſtruction of clepſydræ or water clocks. Theory of clepſydræ or water-clocks.

A clepſydra, or water clock, is a machine which, filled with water, meaſures time by the deſcent of the fluid ſurface. See Part III. on *Hydraulic Machinery*.

It has already been demonſtrated in Prop. IV. that the times in which the ſurface AB deſcends to DE and RT, &c. are as the areas GMrH, GMtU, &c. If ſuch a form therefore is given to the veſſel that the areas GMrH, GMtU, &c. increaſe uniformly as the times, or are to one another as the numbers 1, 2, 3, 4, 5, &c. the times in which the ſurface AB deſcends to DE, and RT, &c. will be in the ſame ratio, and the veſſel will form a machine for meaſuring time. If the veſſel is cylindrical and empties itſelf in 12 hours, its altitude may be divided in ſuch a manner that the fluid ſurface may take exactly an hour to deſcend through each diviſion. Let the cylindrical veſſel, for example, be divided into 144 equal parts, then the ſurface of the water, when the twelve hours begins to run, will be 144 parts above the bottom of the veſſel; when one hour is completed, the ſurface will be 121 parts above the bottom, and ſo on in the following manner. Fig. 5.

Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12
Diſtance of each Hour above the bottom.	144	121	100	81	64	49	36	25	16	9	4	1	0
Number of Parts in each Hour.	23	21	19	17	15	13	11	9	7	5	3	1	

For ſince the velocity with which the ſurface AB deſcends, the area of that ſurface being always the ſame, is as the ſquare roots of its altitude above the orifice (Prop. I. Cor. 6.); and ſince the velocities are as the times of deſcription, the times will alſo be as the ſquare roots of the altitudes, that is, when

12 11 10 9 &c. are the times

144 121 100 81 will be the altitudes of the ſurface. Q.E.D.

Prop. VIII.

160. To explain the lateral communication of motion in fluids.

Lateral communication of motion in fluids. Fig. 9.

This property of fluids in motion was diſcovered by M. Venturi, profeſſor of natural philoſophy in the univerſity of Modena, who has illuſtrated it by a variety of experiments in his work on the lateral communication of motion in fluids. Let a pipe AC, about half an inch in diameter and a foot long, proceeding from the reſervoir AB, and having its extremity bent into the form CD, be inſerted into the veſſel CDG, whoſe ſide DG gradually riſes till it paſſes over the rim of the veſſel. Fill this veſſel with water, and pour the ſame fluid into the reſervoir AB, till, running down the pipe AC, it forms the ſtream EGH. In a ſhort while, the water in the veſſel CDG will be carried off by the current EG, which communicates its motion to the adjacent fluid. In the ſame way, when a ſtream of water runs through air, it drags the air along with it, and produces wind. Hence we have the water blowing machine which conveys a blaſt to furnaces, and which ſhall be deſcribed in a future part of this article. The lateral communication of motion, whether the ſurrounding fluid be air or water, is well illuſtrated by the following beautiful experiment of Venturi's. In the ſide of the reſervoir AB inſert the horizontal pipe P about an inch and a half in diameter, and five inches long. At the point o of this pipe, about ſeven-tenths of an inch from the reſervoir, faſten the bent glaſs tube onm, whoſe cavity communicates with that of the pipe, whilſt its other extremity is immerſed in coloured water contained in the ſmall veſſel F. When water is poured into the reſervoir AB, having no connection with the pipe C, ſo that it may iſſue from the horizontal pipe, the red liquor will riſe towards m in the incurvated tube onm. If the deſcending leg of this glaſs ſyphon be ſix inches and a half longer than the other, the red liquor will riſe to the very top of the ſyphon, enter the pipe P, and running out with the other water will in a ſhort time leave the veſſel F empty. Now the cauſe of this phenomenon is evidently this: When the water begins to flow from the pipe P, it communicates with the air in the ſyphon onm, and drags

Water blowing machine.

Fig. 9.

drags a portion along with it. The air in the ſyphon is therefore rarefied, and this proceſs of rarefaction is conſtantly going on as long as the water runs through the horizontal pipe. The equilibrium between the external air preſſing upon the fluid in the veſſel F, and that included in the ſyphon, being thus deſtroyed, the red liquor will riſe in the ſyphon, till it communicates with the iſſuing fluid, and is dragged along with it through the orifice of the pipe P, till the veſſel F is emptied.

PROP. IX.

161. To find the horizontal diſtance to which fluids will ſpout from an orifice perforated in the ſide of a veſſel, and the curve which it will deſcribe.

Theory of vertical and oblique jets.
Plate CCLXVIII. Fig. 1.

Let AB be a veſſel filled with water, and C an orifice in its ſide, ſo inclined to the horizon as to diſcharge the fluid in the direction CP. If the iſſuing fluid were influenced by no other force except that which impels it out of the orifice, it would move with an uniform motion in the direction CP. But immediately upon its exit from the orifice C it is ſubject to the force of gravity, and is therefore influenced by two forces, one of which impels it in the direction CP, and the other draws it downwards in vertical lines. Make CE equal to EG, and CP double of CS the altitude of the fluid. Draw PL parallel to CK and join SL. Draw alſo EF, GH parallel to CN, and FM, HN parallel to CG, and let CM, CN repreſent the force of gravity, or the ſpaces through which it would cauſe a portion of fluid to deſcend in the time that this portion would move through CE, CG reſpectively by virtue of the impulſive force. Now, it follows from the compoſition of forces, (DYNAMICS, 135.) that the fluid at C, being ſolicited in the direction CE by a force which would carry it through CE in the ſame time that the force of gravity would make it fall through CM, will deſcribe the diagonal CF of the parallelogram CEFM, and will arrive at F in the ſame time that it would have reached E by its impulſive force, or M by the force of gravity; and for the ſame reaſon the portion of the fluid will arrive at H in the ſame time that it would have reached G by the one force, and N by the other. The fluid therefore being continually deflected from its rectilineal direction CP by the force of gravity, will deſcribe a curve line CEHP, which will be a parabola: for ſince the motion along CP muſt be uniform, CE, CG will be to one another as the times in which they are deſcribed; and may therefore repreſent the times in which the fluid would arrive at E and G, if influenced by no other force. But in the time that the fluid has deſcribed CE gravity has made it fall through EF, and in the time that it would have deſcribed CG, gravity has cauſed it to fall through GH. Now, ſince the ſpaces are as the ſquares of the times in which they are deſcribed, (DYNAMICS, 37. 2.) we ſhall have $EF:GH = \overline{CE}^2 : \overline{CG}^2$. But on account of the parallelograms CEFM, CGHN, EF and GH are equal to CM and CN reſpectively, and MF, NH to CE, CG reſpectively; therefore $CM:CN = \overline{MF}^2 : \overline{NH}^2$, which is the property of the parabola, CM, CN being the abſciſſæ, and ME, NH the ordinates (CONIC SECTIONS, Part I. Prop. IX. Cor.)

162. On account of the parallels LP, CX, LC, GX, the triangles LCP, GCX are ſimilar, and therefore (GEOM. Sect. IV. Theor. XX.) $CG:CX = PC:PL$ and $GX:CX = CL:PL$. Hence $CG = \frac{CX \times PC}{PL}$, and $GX = \frac{CX \times CL}{PL}$; but ſince $PC = 2CS$, we have $CG = \frac{CX \times 2CS}{PL}$, and ſince $GX = GX - HX$, we ſhall have $GH = \frac{CX \times CL}{PL} - HX$. But, as the parameter of the parabola CRK is equal to 4 CS (1), we have, by the property of this conic ſection, $\overline{NH}^2 = CN \times 4\,CS$, or $\overline{CG}^2 = 4\,\overline{GH} \times CS$; therefore, by ſubſtituting in this equation the preceding values of CG and GH, we ſhall have $\overline{CX}^2 \times CS = CX \times CL \times PL - HX \times \overline{PL}^2$. Now, it is evident, from this equation, that HX is nothing, or vaniſhes when $CX = 0$, or when $CX = \frac{CL \times PL}{CS}$, for HX being $= 0$, $HX \times \overline{PL}^2$, will alſo be $= 0$, and the equation will become $\overline{CX}^2 \times CS = CX \times CL \times PL$, or dividing by CX and CS, it becomes $CX = \frac{CL \times PL}{CS}$. But when HX vaniſhes towards K, CX is equal to CK, conſequently $CK = \frac{CL \times PL}{CS}$. Biſect CK in T, then $CT = \frac{CK}{2}$, and $CT = \frac{CL \times PL}{2\,CS}$. Draw TR perpendicular to CK, and TR will be found $= \frac{\overline{CL}^2}{4\,CS}$. Then if Hm be drawn at right angles to HX, we ſhall have $CX = CT - Hm = \frac{CL \times PL}{2\,CS} - Hm$ and $HX = RT - Rm = \frac{\overline{CL}^2}{4\,CS} - Rm$. After ſubſtituting theſe values of CX and HX in the equation $\overline{CX}^2 \times CS = CX \times CL \times PL - HX \times \overline{PL}^2$, it will become, after the neceſſary reductions, $\overline{Hm}^2 = \frac{\overline{PL}^2}{CS} \times Rm$. The curve CRK

(1) The parameter of the parabola deſcribed by the iſſuing fluid, is equal to *four times* the altitude of the fluid above the orifice. For ſince the fluid iſſues at C with a velocity equal to that acquired by falling through SC, if this velocity were continued uniform, the fluid would move through 2 CS or CP, in the ſame time that a heavy body would fall through SC. Draw PQ parallel to CS, and QW to CP; then ſince Q is in the parabola, the fluid will deſcribe CP uniformly in the ſame time that it falls through CW by the force of gravity, therefore $CW = CS$. Now $CP = 2\,CS$, and $\overline{CP}^2 = 4\,\overline{CS}^2 = 4 \times CS \times CS = 4 \times CS \times CW$; but it is a property of the parabola, that the ſquare of the ordinate WQ or CP is equal to the product of the abſciſſa CW and the parameter, therefore 4 CS is the parameter of the parabola.

CRK is therefore a parabola whose vertex is R, its axis RT and its parameter $\frac{\overline{PL}^2}{CS}$, R$m$ being an abscissa of the axis, and Hm its corresponding ordinate. Now, making a=CS, the altitude of the reservoir; R = radius; m=PL the sine of the angle PCL; and n=CL, the cosine of the same angle, CP being radius. Then CP : PL=R : m, therefore PL×R=CP×m, and dividing by R and substituting 2a or 2CS instead of its equal CP, we have PL$=\frac{2am}{R}$, and by the very same reasoning, we have CL$=\frac{2an}{R}$. Hence RT$=\frac{\overline{CL}^2}{4CS}$ will be $=\frac{4a^2n^2}{R^2}$ divided by 4a, or RT$=a\times\frac{n^2}{R^2}$, and CT$=\frac{CL\times PL}{2\,CS}=\frac{4a^2mn}{2a\times R^2}=2a\times\frac{mn}{R^2}$, and the parameter of the parabola $=\frac{PL^2}{CS}=\frac{4a^2m^2}{a\times R^2}=4a\times\frac{m^2}{R^2}$.

Fig. 2. 163. Hence we have the following construction. With ½CS as radius, describe the semicircle SGC, which the direction CR of the jet or issuing fluid meets in G. Draw GN perpendicular to CS, and having prolonged it towards R, make GR equal to GN. From R let fall RT perpendicular to CK and meeting it in T, and upon RT, CT describe the parabola CRK having its vertex in R, this parabola shall be the course of the issuing fluid. For by the construction NR or CT=2 GN, and on account of the similar triangles SGC, CGN, SC : SG=CG : GN; hence SC × GN = SG × CG, or 2 GN, or CT$=\frac{2\,SG\times CG}{SC}$. But from the similarity of triangles CS : CG=SG : GN and CS : CG=CG : CN, consequently, when CG is radius or =R, GN will be the sine m of the angle GCS, and CN its cosine n; and we shall then have, by Euclid VI. 16. and reduction SG$=\frac{CS\times m}{R}$, and CG$=\frac{CS\times n.}{R}$. By substituting these values of SG and CG in the equation CT$=\frac{2\,SG\times CG}{SC}$, we have CT $=\frac{2}{SC}\times\frac{CS\times m}{R}\times\frac{CS\times n}{R}=\frac{2\,CS\times m\times CS\times n}{CS\times R\times R}=\frac{2CS\times mn}{R^2}=2a\times\frac{mn}{R^2}$. But the parameter P of the parabola CRK is equal to $\frac{\overline{CT}^2}{RT}$, because it is a third proportional to the abscissa and its ordinate, therefore P$=\frac{4a^2\times m^2n^2}{R^2\times RT}$. Now RT = CN, and CN$=\frac{NG\times n}{m}$, because CN : NG=$m$: n, or CN =RT$=a\times\frac{n^2}{R^2}$ by substituting the preceding value of NG. Therefore the parameter P$=\left(\frac{4a^2\times m^2n^2}{R^4}\right)\div\left(\frac{a\times n^2}{R^2}\right)$ $=4a\times\frac{m^2}{R^2}$, which is the same value of the parameter as was found in the preceding article, and therefore verifies the construction.

164. Cor. 1. Since NG=GR and CT=TK, the amplitude or distance CK, to which the fluid will reach on a horizontal plane, will be 4 NG, or quadruple the sine of the angle formed by the direction of the jet and a vertical line, the chord of the arch CG being radius.

165. Cor. 2. If Sn be made equal to CN, and ng be drawn parallel to CT, and gr be made equal to ng; then if the direction of the jet be Cg, the fluid will describe the parabola CrK whose vertex is r, and will meet the horizontal line in K, because ng=NG, and 4ng=4 NG=CK. The same may be shewn of every other pair of parabolas whose vertices Rr are equidistant from ac a horizontal line passing through the centre of the circle.

166. Cor. 3. Draw the ordinate ab through the centre a, and since this is the greatest ordinate that can be drawn, the distance to which the water will spout, being equal to 4a, will be the greatest when its line of direction passes through b, that is, when it makes an angle of 45° with the horizon.

167. Cor. 4. If an orifice be made in the vessel AB at N, and the water issues horizontally in the direction NG, it will describe the parabola NT, and CT will be equal to 2 NG. For (by Prop. IX. note) the parameter of the parabola NT is equal to 4 NS, and by the property of the parabola $\overline{CT}^2$= NC × 4 NS, or ½CT=2$\sqrt{NC\times NS}$; but by the property of the circle (Geom. Sect. IV. Theor. XXVIII.) $\overline{NG}^2$=NC×NS, and NG=$\sqrt{NC\times NS}$, hence CT=2NG. If the fluid is discharged from the orifice at n, so that Sn=CN, ng will be =NG, and it will spout to the same distance CT.

Prop. X.

168. To determine the pressure exerted upon pipes by the water which flows through them.

Let us suppose the column of fluid CD divided into an infinite number of laminæ EFfe. Then friction being abstracted, every particle of each lamina will move with the same velocity when the pipe CD is horizontal. Now the velocity at the vena contracta mn may be expressed by $\sqrt{A}$, A being the altitude of the fluid in the reservoir. But the velocity at the *vena contracta* is to the velocity in the pipe, as the area of the latter is to the area of the former. Therefore δ being the diameter of the *vena contracta*, and d that of the pipe CD, the area of the one will be to the area of the other, as $\delta^2 : d^2$, (Geometry, Sect. VI. Prop. IV.) consequently we shall have $d^2 : \delta^2=\sqrt{A} : \frac{\delta^2\sqrt{A}}{d^2}$, the velocity of the water in the pipe. But since the velocity $\sqrt{A}$ is due to the altitude A, the velocity $\frac{\delta^2\sqrt{A}}{d^2}$ will be due to the altitude $\frac{\delta^4 A}{d^4}$. Now as each particle of fluid which successively reaches the extremity DH of the pipe, has a tendency to move with the velocity $\sqrt{A}$, while it moves only with the velocity $\frac{\delta^2\sqrt{A}}{d^2}$, the extremity D$n$ of the pipe will sustain a pressure equal to the difference of the pressures produced by the velocities $\sqrt{A}$ and $\frac{\delta^2\sqrt{A}}{d^2}$, that is, by

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by a pressure $A-\frac{\delta^4 A}{d^4}$, A representing the pressure which produces the velocity $\sqrt{A}$, and $\frac{\delta^4 A}{d^4}$ the pressure which produces the velocity $\frac{\delta^2 \sqrt{A}}{d^2}$. But this pressure is distributed through every part of the pipe CD, consequently the pressure sustained by the sides of the pipe will be $A-\frac{\delta^4 A}{d^4}$.

169. Cor. 1. If a very small aperture be made in the side of the pipe, the water will issue with a velocity due to the height $A-\frac{\delta^4 A}{d^4}$. When the diameter δ of the orifice is equal to the diameter d of the pipe, the altitude becomes A—A or nothing; and if the orifice is in this case below the pipe, the water will descend through it by drops. Hence we see the mistake of those who have maintained, that when a lateral orifice is pierced in the side of a pipe, the water will rise to a height due to the velocity of the included water.

170. Cor. 2. Since the quantities of water, discharged by the same orifice, are proportional to the square roots of the altitudes of the reservoir, or to the pressures exerted at the orifice, the quantity of water discharged by a lateral orifice may be easily found. Let W be the quantity of water discharged in a given time by the proposed aperture under the pressure A, and let w be the quantity discharged under the pressure $A-\frac{\delta^4 A}{d^4}$. Then $W:w=\sqrt{A}:\sqrt{A-\frac{\delta^4 A}{d^4}}$, consequently, $w\times\sqrt{A}=W\times\sqrt{A-\frac{\delta^4 A}{d^4}}$ and $w=\frac{W\times\sqrt{A-\frac{\delta^4 A}{d^4}}}{\sqrt{A}}=W\frac{\sqrt{d^4-\delta^4}}{d^2}$.

Therefore, since W may be determined by the experiments in the following chapter, w is known.

Chap. II. *Account of Experiments on the Motion of Water discharged from vessels, either by Orifices or additional Tubes, or running in Pipes or open Canals.*

Ratio between the area of the vena contracta and the orifice.

171. In the preceding chapter, we have taken notice of the contraction produced upon the vein of fluid issuing from an orifice in a thin plate, and have endeavoured to ascertain its cause. According to *Sir Isaac Newton*, the diameter of the *vena contracta* is to that of the orifice as 21 to 25. *Polenus* makes it as 11 to 13; *Bernouilli* as 5 to 7; the *Chevalier de Buat* as 6 to 9; *Bossut* as 41 to 50; *Michelotti*, as 4 to 5; and *Venturi*, as 4 to 5. This ratio, however, is by no means constant. It varies with the form and position of the orifice, with the thickness of the plate in which the orifice is made, and likewise with the form of the vessel and the weight of the superincumbent fluid. But these variations are too trifling to be regarded in practice.—We shall now lay before the reader an account of the results of the experiments of different philosophers, but particularly those of the Abbé Bossut, to whom the science is deeply indebted both for the accuracy and extent of his labours.

Sect. I. *On the Quantity of Water discharged from Vessels constantly full by Orifices in thin Plates.*

Quantities of water discharged by orifices in thin plates, according to the experiments of Bossut.

172. In the following experiments, which were frequently repeated in various ways, the orifice was pierced in a plate of copper about half a line thick. When the orifice is in the bottom of the vessel, it is called a *horizontal* orifice, and when it is in the side of it, it is called a *lateral* orifice.

Table I. *Shewing the Quantity of Water discharged in one minute, by orifices differing in form and position.*

Altitude of the fluid above the centre of the orifice.	Form and position of the orifice	The orifice's diameter.	N° of cub. in. discharged in a minute.
Ft. In. Lin.	Circular and Horizontal	6 lines	2311
11 8 10	Circular and Horizontal	1 inch	9281
	Circular and Horizontal	2 inches	37203
	Rectangular and Horizontal	1 inch by 3 lines	2933
	Horizontal and Square	1 inch, side	11817
	Horizontal and Square	2 inch, side	47361
9 0 0	Lateral and Circular	6 lines	2018
	Lateral and Circular	1 inch	8135
4 0 0	Lateral and Circular	6 lines	1353
	Lateral and Circular	1 inch	5436
5 0 7	Lateral and Circular	1 inch	628

173. From the results contained in the preceding table, we may draw the following conclusions.

1. That the quantities of water discharged in equal times by different apertures, the altitudes of the fluid being the same, are very nearly as the areas of the orifices. That is, if A or a represent the areas of the orifices, and W, w the quantities of water discharged,

$$W:w=A:a.$$

2. The quantities discharged in equal times by the same aperure, the altitude of the fluid being different, are to one another very nearly as the square roots of the altitudes of the water in the reservoir, reckoning from the centres of the orifices. That is, if H, h be the different altitudes of the fluid, we shall have $W:w=\sqrt{H}:\sqrt{h}$.

3. Hence we may conclude in general that the quantities discharged in the same time by different apertures, and under different altitudes in the reservoir, are in the compound ratio of the areas of the orifices, and the square roots of the altitudes.—Thus, if W, w be the quantities discharged in the same time from the orifices A, a, under the same altitude of water; and if W′, w be the quantities discharged in the same time by the same aperture a under different altitudes H, h: then by the first of the two preceding articles

$W:w=A:a$, and by the second

$w:W=\sqrt{H}:\sqrt{h}$. Multiplying these analogies together, gives us.

$Ww:W'w=A\sqrt{H}:a\sqrt{h}$, and dividing by w,

$W:W'=A\sqrt{H}:a\sqrt{h}$.

This

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This rule is ſufficiently correct in practice; but when great accuracy is required, the following remarks muſt be attended to.

4. Small orifices diſcharge leſs water in proportion than great ones, the altitude of the fluid being the ſame. The circumference of the ſmall orifices being greater in proportion to the iſſuing column of fluid than the circumferences of greater ones, the friction, which increaſes with the area of the rubbing ſurfaces, will alſo be greater, and will therefore diminiſh the velocity, and conſequently the quantity diſcharged.

5. Hence of ſeveral orifices whoſe areas are equal, that which has the ſmalleſt circumference will diſcharge more water than the reſt under the ſame altitude of fluid in the reſervoir, becauſe in this caſe the friction will be leaſt.—Circular orifices, therefore, are the moſt advantageous of all, for the circumference of a circle is the ſhorteſt of all lines that can be employed to incloſe a given ſpace.

6. In conſequence of a ſmall increaſe which the contraction of the vein of fluid undergoes, in proportion as the altitude of the water in the reſervoir augments, the quantity diſcharged ought alſo to diminiſh a little as that altitude increaſes.

By attending to the preceding obſervations, the reſults of theory may be ſo corrected, that the quantities of water diſcharged in a given time may be determined with the greateſt accuracy poſſible.

Compariſon between the theoretical and the real diſcharges from a circular orifice.

174. The abbé Boſſut has given the following table containing a compariſon of the theoretical with the real diſcharges, for an orifice one inch diameter, and for different altitudes of the fluid in the reſervoir. The real diſcharges were not found immediately by experiment, but were determined by the precautions pointed out in the preceding articles, and may be regarded to be as accurate as if direct experiments had been employed. The fourth column was computed by M. Prony.

TABLE II. *Compariſon of the Theoretic with the Real diſcharges from an orifice one inch in diameter.*

Conſtant altitude of the water in the reſervoir above the centre of the orifice.	Theoretical diſcharges through a circular orifice *one* inch in diameter.	Real diſcharges in the ſame time through the ſame orifice.	Ratio of the theoretical to the real diſcharges.
Paris Feet.	Cubic inches.	Cubic inches.	
1	4381	2722	1 to 0.62133
2	6196	3846	1 to 0.62073
3	7589	4710	1 to 0.62064
4	8763	5436	1 to 0.62034
5	9797	6075	1 to 0.62010
6	10732	6654	1 to 0.62000
7	11592	7183	1 to 0.61965
8	12392	7672	1 to 0.61911
9	13144	8135	1 to 0.61892
10	13855	8574	1 to 0.61883
11	14530	8990	1 to 0.61873
12	15180	9384	1 to 0.61819
13	15797	9764	1 to 0.61810
14	16393	10130	1 to 0.61795
15	16968	10472	1 to 0.61716
1	2	3	4

Deduction from the preceding table.

175. It is evident from the preceding table, that the theoretical, as well as the real diſcharges, are nearly proportional to the ſquare roots of the altitudes of the fluid in the reſervoir. Thus, if we take the altitudes 1 and 4, whoſe ſquare roots are as 1 to 2, the real diſcharges taken from the table are 2722, 5436, which are to one another very nearly as 1 to 2, their real ratio being as 1 to 1.997.

The fourth column of the preceding table alſo ſhows us that the theoretical are to the real diſcharges nearly in the ratio of 1 to 0.62, or more accurately, as 1 to 0.61938; therefore 0.62 is the number by which we muſt multiply the diſcharges as found by the formulæ in the preceding chapter, in order to have the quantities of water actually diſcharged.

Application and uſe of the preceding table.

176. In order to find the quantities of fluid diſcharged by orifices of different ſizes, and under different altitudes of water in the reſervoir, we muſt uſe the table in the following manner. Let it be required, for example, to find the quantity of water furniſhed by an orifice three inches in diameter, the altitude of the water in the reſervoir being 30 feet. As the real diſcharges are in the compound ratio of the area of the orifices, and the ſquare roots of the altitudes of the fluid, (art. 173. n° 3.), and as the theoretical quantity of water diſcharged by an orifice one inch in diameter, is by the ſecond column of the table 16918 cubic inches in a minute, we ſhall have this analogy, $1\sqrt{15} : 9\sqrt{30} = 16968 : 215961$ cubic inches, the quantity required. This quantity being diminiſhed in the ratio of 1 to .62, being the ratio of the theoretical to the actual diſcharges, gives 133896 for the real quantity of water diſcharged by the given orifice. But (by n° 5. of art. 173.) the quantity diſcharged ought to be a little greater than 133896, becauſe greater orifices diſcharge more than ſmall ones; and by n° 6. the quantity ought to be leſs than 133896, becauſe the altitude of the fluid is double that in the table. Theſe two cauſes, therefore, having a tendency to increaſe and diminiſh the quantity deduced from the preceding table, we may regard 133896 as very near the truth. Had the orifice been leſs than one inch, or the altitude leſs than 15 feet, it would have been neceſſary to diminiſh the preceding anſwer by a few cubic inches. Since the velocities of the iſſuing fluid are as the quantities diſcharged, the preceding reſults may be employed alſo to find the real velocities from thoſe which are deduced from theory.

177. As the velocity of falling bodies is 16.087 feet per ſecond, the velocity due to 16.087 feet will be 32.174 feet per ſecond, and as the velocities are as the ſquare roots of the height, we ſhall have $\sqrt{16.087} : \sqrt{H} = 32.174 : V$ the velocity due to any other height, conſequently $V = \frac{32.174\sqrt{H}}{\sqrt{16.087}} = \frac{32.174\sqrt{H}}{4.011} = 8.016\sqrt{H}$, ſo that 8.016 is the coefficient by which we muſt always multiply the altitude of the fluid in order to have its theoretical velocity.

Reſults of Eytelwein's experiments.

178. According to the experiments of M. Eytelwein, publiſhed at Berlin in 1801, in his treatiſe *Handbuch der Mechanik und der Hydraulik*, the following are the ratios between the theoretical and actual diſcharges, and the coefficients by which the height may be multiplied in order to find the velocities of the iſſuing fluid.

TABLE

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TABLE III. *Results of Eytelwein's Experiments.*

N°	Nature of the orifices employed.	Ratio between the theoretical and real discharges.	Coefficients for finding the velocities.
1	When the orifice has the form of the contracted stream	1 to 0.973	7.8
2	For wide openings whose bottom is on a level with that of the reservoir	1 to 0.961	7.7
3	For sluices with walls in a line with the orifice	1 to 0.961	7.7
4	For bridges with pointed piers	1 to 0.961	7.7
5	For narrow openings whose bottom is on a level with that of the reservoir	1 to 0.861	6.9
6	For smaller openings in a sluice with side walls	1 to 0.861	6.9
7	For abrupt projections and square piers of bridges	1 to 0.861	6.9
8	For openings in sluices without side walls	1 to 0.635	5.1
9	For orifices in a thin plate	1 to 0.625	5.0

179. M. Eytelwein has likewise shown, that the quantity of water discharged from rectangular orifices in the side of a reservoir extending to the surface, may be found by taking two-thirds of the velocity due to the mean height, and allowing for the contraction according to the form of the orifice.

SECT. II. *On the Quantity of Water discharged from Vessels constantly full, by small Tubes adapted to Circular Orifices.*

Quantities of water discharged by small tubes.

180. The difference between the natural discharges, and those deduced from theory, arises from the contraction of the fluid vein, and from the friction of the water against the circumference of the orifice. If the operation of any of these causes could be prevented, the quantities of water actually discharged would approach nearer the theoretical discharges. There is no probability of diminishing friction in the present case by the application of unguents; but if a short cylindrical tube be inserted in the orifice of the vessel, the water will follow the sides of the tube, the contraction of the fluid vein will be in a great measure prevented, and the actual discharges will approximate much nearer to those deduced from theory, than when the fluid issues through a simple orifice.

When the cylindrical tube is two inches long and two in diameter, the fluid vein is contracted as in simple orifices. Plate CCLXVIII. Fig. 4.

181. If a cylindrical tube two inches long, and two inches in diameter, be inserted in the reservoir, and if this orifice is stopped by a piston till the reservoir is filled with water, the fluid, when permitted to escape, will not follow the sides of the tube, that is, the tube will not be filled with water, and the contraction in the vein of fluid will take place in the same manner as if the orifice were pierced in a thin plate. When the cylindrical tube was one inch in diameter, and two inches long, the water followed the sides of the tube, and the vein of fluid ceased to contract. While M. Bossut was repeating this experiment, he prevented the escape of the fluid by placing the instrument MN, consisting of a handle and a circular head, upon the interior extremity of the tube, and found, to his great surprise, that when he withdrew the instrument MN, to give passage to the water, it sometimes followed the sides of the tube, and sometimes detached itself from them, and produced a contraction in the fluid vein similar to that which took place when the first tube was employed. After a little practice, he could produce either of these effects at pleasure. The same phenomenon was exhibited when the length of the tube was diminished to one inch six lines; only it was more difficult to make the fluid follow the circumference of the tube. This effect was still more difficult to produce, when its length was reduced to one inch; and when it was so small as half an inch, the water uniformly detached itself from its circumference, and formed the *vena contracta*.

182. TABLE IV. *Shewing the Quantities of Water discharged by Cylindrical Tubes one inch in diameter with different lengths.*

Quantities of fluid discharged from cylindrical tubes of the same diameters but different lengths.

	Variable lengths of the tubes expressed in lines.		Cubic inches discharged in a minute
Constant altitude of the fluid above the superior base of the tube being 11 feet 8 inches and 10 lines.	The tube being filled with the issuing fluid	48	12274
		24	12188
		18	12168
	The tube not filled with the issuing fluid	18	9282

The experiments in the preceding table were made with tubes inserted in the bottom of the vessel. When the tubes were fixed horizontally in the side of the reservoir, they furnished the very same quantities of fluid, their dimensions and the altitude of the fluid remaining the same.

It appears from the preceding results, that the quantities of water discharged increase with the length of the tube, and that these quantities are very nearly as the square roots of the altitudes of the fluid above the interior orifice of the vertical tube.

We have already seen that the theoretical are to real discharges, as 1 to 0.62, or nearly as 16.1 to 10. But by comparing the two last experiments in the preceding table, it appears that the quantity of fluid discharged by a cylindrical tube where the water follows its sides, is to the quantity discharged by the same tube when the *vena contracta* is formed, as 13 to 10; and since the same quantity must be discharged by the latter method as by a simple orifice, we may conclude

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clude that the quantity discharged according to theory, and that which is discharged by a cylindrical tube and by a simple orifice, are to one another very nearly as the numbers 16, 13, 10. Though the water therefore follows the sides of the cylindrical tube, the contraction of the fluid vein is not wholly destroyed; for the difference between the quantity discharged in this case, and that deduced from theory, is too great to be ascribed to the increase of friction which arises from the water following the circumference of the tube.

183. In order to determine the effect of tubes of different diameters, under different altitudes of water in the reservoir, M. Bossut instituted the experiments the results of which are exhibited in the following table.

Quantities of water discharged by cylindrical tubes of the same length but different diameters.

TABLE V. *Shewing the Quantities of Water discharged by Cylindrical Tubes two inches long, with different Diameters.*

Constant altitude of the water above the orifice.		Diameter of the tube.		Quantity of water discharged in a minute.
Feet.	Inches.		Lines	Cubic inches.
3	10	The tube being filled with the issuing fluid.	6	1689
			10	4703
		The tube not filled with the issuing fluid.	6	1293
			10	3598
2	0	The tube being filled with the issuing fluid.	6	1222
			10	3402
		The tube not filled with the issuing fluid.	6	935
			10	2603

184. By comparing the different numbers in this table we may conclude,

1. That the quantities of water discharged by different cylindrical tubes of the same length, the altitude of the fluid remaining the same, are nearly as the areas of the orifices, or the squares of their diameter.

2. That the quantities discharged by cylindrical tubes of the same diameter and length, are nearly as the square roots of the altitude of the fluid in the reservoir.

3. Hence the quantities discharged during the same time, by tubes of different diameters, under different altitudes of fluid in the reservoir, are nearly in the compound ratio of the squares of the diameters of the tube, and the square roots of the altitudes of the water in the reservoir.

4. By comparing these results with those which were deduced from the experiments with simple orifices, it will be seen that the discharges follow the same laws in cylindrical tubes as in simple orifices.

185. The following table is deduced from the foregoing experiments, and contains a comparative view of the quantities of water discharged by a simple orifice, according to theory, and those discharged by a cylindrical tube of the same diameter under different altitudes of water. The numbers might have been more accurate by attending to some of the preceding remarks; but they are sufficiently exact for any practical purpose. The fourth column, containing the ratio between the theoretical and actual discharges, was computed by M. Prony.

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Comparison of the theoretical with the real discharges in *cylindrical* tubes.

TABLE VI. *Comparison of the Theoretical with the Real Discharges from a Cylindrical Tube one inch in Diameter and two inches Long.*

Constant altitude of the water in the reservoir above the centre of the orifice.	Theoretical discharges through a circular orifice one inch in diameter.	Real discharges in the same time by a cylindrical tube *one* inch in diameter and *two* inches long.	Ratio of the theoretical to the real discharges.
Paris Feet	Cubic inches	Cubic inches.	
1	4381	3539	1 to 0.81781
2	6196	5002	1 to 0.80729
3	7589	6126	1 to 0.80724
4	8763	7070	1 to 0.80681
5	9797	7900	1 to 0.80638
6	10732	8654	1 to 0.80638
7	11592	9340	1 to 0.80573
8	12392	9975	1 to 0.80496
9	13144	10579	1 to 0.80485
10	13855	11151	1 to 0.80483
11	14530	11693	1 to 0.80477
12	15180	12205	1 to 0.80403
13	15797	12699	1 to 0.80390
14	16393	13177	1 to 0.80382
15	16968	13620	1 to 0.80270
1	2	3	4

By comparing the preceding table with that in art. 174. we shall find that cylindrical tubes discharge a much greater quantity of water than simple orifices of the same diameter, and that the quantities discharged are as 81 to 62 nearly. This is a curious phenomenon, and will be afterwards explained.

186. The application of this table to other additional tubes under different altitudes of the fluid, not contained in the first column, is very simple. Let it be required, for example, to find the quantity of water discharged by a cylindrical tube, 4 inches in diameter, and 8 inches long, the altitude of the fluid in the reservoir being 25 feet. In order to resolve this question, find (by art. 176.) the theoretical quantity discharged, which in the present instance will be 350490 cubic inches, and this number diminished in the ratio of 1 to 0.81 will give 284773 for the quantity required. The length of the tube in this example was made 8 inches, because, when the length of the tube is less than twice its diameter, the water does not easily follow its interior circumference. If the tube were longer than 8 inches, the quantity of fluid discharged would have been greater, because it uniformly increases with the length of the tube; the greatest length of the tube being always small, in comparison with the altitude of the fluid in the reservoir.

187. Hitherto we have supposed the tube to be exactly cylindrical. When its interior surface, however, is conical, the quantities discharged undergo a considerable variation, which may be estimated from the following experiments of the marquis Poleni, published in his work *De Castellis per quæ derivantur fluviorum aquæ*, &c. which appeared at Padua in 1718.

TABLE

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TABLE VII. *Shewing the Quantities of Water discharged by Conical Tubes of different Diameters.*

Quantities of water discharged by *conical* tubes according to the experiments of M. Poleni.

-		Apertures Employed.	Interior diameter.	Exterior diameter.	Quantity discharged in a min. in cubic ft.	Time in which 73035 cub. inches were discharged.
Constant altitude of the water in the reservoir, 256 lines, or 1 foot 9 inches and 4 lines.	Length of each tube 92 lines, or 7 inches 8 lines.	Orifice in a thin plate,	26 lines	26 lines	15877	4′ 36″
		Cylindrical tube,	26	26	23434	3′ 7″
		1st Conical tube,	33	26	24758	2′ 57″
		2d Conical tube,	42	26	24619	2′ 58″
		3d Conical tube,	60	26	24345	3′ 0″
		4th Conical tube,	118	26	23687	3′ 5″

From these experiments we are authorized to conclude, 1. That the real discharges are less than those deduced from theory, which in the present case is 27425 cubic inches in a minute, and 2. That when the interior orifice of the tube is enlarged to a certain degree, the quantity discharged is increased; but that when this enlargement is too great, a contraction takes place without the exterior orifice, and the quantity discharged suffers a diminution. If the smallest base of the conical tube be inserted in the side of the reservoir, it will furnish more water than a cylindrical tube whose diameter is equal to the smallest diameter of the conical tube; for the divergency of its sides changes the oblique motion which the particles would otherwise have had, when passing from the reservoir into the tube.

Experiments of Venturi with tubes of various forms.

Plate CCLXVIII. Fig. 4.

188. The experiments of Poleni and Bossut having been made only with tubes of a conical and cylindrical form, M. Venturi was induced to institute a set of experiments, in which he employed tubes of the various forms exhibited in fig. 4. The results of his researches are contained in the following table, for which we have computed the column containing the number of cubic inches discharged in one minute, in order that the experiments of the Italian philosopher may be more easily compared with those which are exhibited in the preceding tables. The constant altitude of the water in the reservoir was 32.5 French inches, or 34.642 English inches. The quantity of water which flowed out of the vessel in the times contained in the first column was 4 French cubic feet, or 4.845 English cubic feet. The measures in the table are all English, unless the contrary be expressed.

TABLE VIII. *Shewing the Quantities of Water discharged from Orifices of various forms, the constant Altitude of the Fluid being* 32.5 *French, or* 34.642 *English inches.*

N°	Nature and dimensions of the tubes and orifices.	Time in which 4 Paris cub. ft. were discharged	Paris cubic inches discharged in a minute.
		Seconds.	
1	A simple circular orifice in a thin plate, the diameter of the aperture being 1.6 inches,	41	10115
2	A cylindrical tube 1.6 inches in diameter, and 4.8 inches long,	31	13378
3	A tube similar to B, figure 4. which differs from the preceding only in having the contraction in the shape of the natural contracted vein,	31	13378
4	The short conical adjutage, A, figure 4. being the first conical part of the preceding tube,	42	9874
5	The tube D, figure. 4. being a cylindrical tube adapted to the small conical end A, *m n* being 3.2 inches long,	42.5	9758
6	The same adjutage, *m n* being 12.8 inches,	45	9216
7	The same adjutage, *m n* being 25.6 inches,	48	8640
8	The tube C, consisting of the cylindrical tube of Exp. 2. placed over the conical part of A,	32.5	12760
9	The double conical pipe E, $ab=ac=1.6$ inches, $cd=0.977$ inches, $ef=1.376$ inches, and the length ce of the outer cone $=4.351$ inches,	27.5	15081
10	The tube F, consisting of a cylindrical tube 3.2 inches long, and 1.376 inches in diameter, interposed between the two conical parts of the preceding,	28.5	14516

Important facts deducible from Venturi's experiments.

Fig 4.

189. These experiments of Venturi inform us of a curious fact, extremely useful to the practical hydraulist. They incontestably prove, that when water is conveyed through a straight cylindrical pipe of an unlimited length, the discharge of water may be increased only by altering the form of the terminations of the pipe, that is, by making the end of the pipe A of the same form as the *vena contracta*, and by forming the other extremity BC into a truncated cone, having its length BC about 9 times the diameter of the cylindrical tube AB, and the aperture at C to that at B, as 18 to 10. By giving this form to the pipe, it will discharge more than twice as much water in a given time, the quantity discharged by the cylindrical pipe being to the

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the quantity discharged by the pipe of the form ABC, as 10 to 24.

190. M. Venturi also found, that the quantities of water discharged out of a straight tube, a curved tube forming a quadrantal arc, and an elbowed tube with an angle of 90°, each branch having a horizontal position, are to one another nearly as the numbers 70, 50, 45. Hence we see the disadvantages of sinuosities and bendings in conduit pipes. In the construction of hydraulic machines, any variation in the internal diameter of the pipe ought to be carefully avoided, excepting those alterations at the extremities which we have recommended in the preceding paragraph.

Results of Eytelwein's experiments on additional tubes.

191. It appears from the researches of Eytelwein, that when the shortest tube that will make the water follow its sides is applied to the reservoir, the quantity discharged will be to that deduced from theory, as 0.810 to 1.000, and the multiplier for finding the velocity will be 6.5. When the lengths of the tubes are increased from *two* to *four* times their diameter, the ratio of the actual and theoretical discharges will be 0.822 to 1.000, and the constant multiplier for finding the velocity will be 6.6. In employing a conical tube approaching to the figure of the *vena contracta*, the ratio of the discharges was as 0.92 to 1.00, and when its edges were rounded off, as 0.98 to 1.00 computing from its least section. He found also that the smallest quantity of water was discharged, when the interior extremity of the tube projected within the reservoir, the quantity furnished in this case being reduced to one half of what was discharged when the tube had its proper position.

Reason why cylindrical tubes furnish more water than orifices of the same diameter.

192. When a cylindrical tube is applied to an orifice, the oblique motion of the particles which enter it is diminished; the vertical velocity of the particles, therefore, is increased, and consequently the quantity of water discharged. M. Venturi maintains that the pressure of the atmosphere increases the expence of water through a simple cylindrical tube, and that in conical tubes, the pressure of the atmosphere increases the expenditure in the ratio of the exterior section of the tube to the section of the contracted vein, whatever be the position of the tube.

Best form for tubes employed to discharge water.

193. Of all the tubes that can be employed for discharging water, that is the most advantageous which has the form of a contracted vein. Hence, it will be a truncated cone with its greatest base next the reservoir, having its length equal to half the diameter of that base, and the area of the two orifices as 8 to 5, or their diameters in the subduplicate ratio of these numbers, viz. as $\sqrt{8} : \sqrt{5}$.

SECT. III. *Experiments on the Exhaustion of Vessels.*

Difficulty in determining the time when a vessel is completely exhausted.

194. It is almost impossible to determine the exact time in which any vessel of water is completely exhausted. When the surface of the fluid has descended within a few inches of the orifice, a kind of conoidal funnel is formed immediately above the orifice. The pressure of the superincumbent column being therefore removed, the time of exhaustion is prolonged. The water falls in drops; and it is next to impossible to determine the moment when the vessel is empty. Instead, therefore, of endeavouring to ascertain the time in which vessels are completely exhausted, the abbé Bossut has determined the times in which the superior surface of the fluid descends through a certain vertical height, and his results will be found in the following table.

TABLE IX. *Shewing the times in which Vessels are partly exhausted.*

Primitive altitude of the water in the vessel.	Constant area of a horizontal section of the vessel.	Diameter of the circular orifice.	Depression of the upper surface of the fluid.	Time in which this depression takes place.	
Paris Feet	Square Feet	Inches.	Feet.	Min.	Sec.
11.6666	9	1	4	7	$25\frac{1}{2}$
		2	4	1	52
		1	9	20	$24\frac{1}{2}$
		2	9	5	6
PG	DE	$\sqrt{\frac{A}{.7854}}$	PG—PU	T	

Plate CCLXVII. Figs. 5, 6.

Comparison of the experiments with the results of theory.

195. In order to compare these experimental results with those deduced from theory, we must employ the formula (in Prop. V. 156.) where the time in which the surface descends through any height is $T = \frac{DE \times \sqrt{PG} - \sqrt{PU}}{A\sqrt{16.087}}$, in which DE is the area of a section of the vessel, PG the primitive altitude of the surface above the centre of the orifice, PU the altitude of the surface after the time T is elapsed, A the area of the orifice, and 16.087 the space through which a heavy body descends in one second of time. That the preceding formula may be corrected, we must substitute 0.62 A or $\frac{5\,A}{8}$, instead of A, in the formula, 0.62, A being the area of the *vena contracta;* and as the measures in the preceding table are in Paris feet, we must use 15.085 instead of 16.087, the former being the distance in Paris feet, and the latter the distance in English feet, which falling bodies describe in a second. The formula, therefore, will become $T = \frac{DE \times \sqrt{PG} - \sqrt{PU}}{0.62\,A\sqrt{15.085}}$, and when the computations are made for the different diameters of the orifices and the different depressions of the fluid surface, the results will be had, which are exhibited in the last column of the following table, containing the values of T, according to theory and experience.

TABLE X. *Comparison of the results of Theory with those of Experience.*

Diameter of the circular orifice.	Depression of the upper surface of the fluid.	Time of the depression of the surface by experiment.		Time of the depression of the surface by the formula.		Difference between the theory and the experiments.
Inches.	Feet.	Min.	Sec.	Min.	Sec.	Seconds.
1	4	7	$25\frac{1}{2}$	7	22.36	3.14
2	4	1	52	1	50.59	1.41
1	9	20	$24\frac{1}{2}$	20	16	8.50
2	9	5	6	5	4	2.00

It

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It appears from this table, that the times of discharge, by experiment, differ very little from those deduced from the corrected formula; and that the latter always err in defect. This may arise from 0.62 being too great a multiplier for finding the corrected diameter of the orifice.—When the orifices are in the sides of the reservoir, the altitude PG, PU of the surface may be reckoned from the centre of gravity of the orifice, unless when it is very large.

Sect. IV. *Experiments on Vertical and Oblique Jets.*

Vertical jets do not rise to the same altitude as that of their reservoirs.

196. We have already seen that, according to theory, vertical jets should rise to the same altitude as that of the reservoirs from which they are supplied. It will appear, however, from the following experiments of Bossut, that jets do not rise exactly to this height. This arises from the friction at the orifice, the resistance of the air, and other causes which shall afterwards be explained.

Table XI. *Containing the Altitudes to which Jets rise through Adjutages of different forms, the Altitude of the Reservoir being Eleven Feet, reckoning from the upper surface of the horizontal Tubes* m n P, o p R.

Plate. CCLXVIII. Fig. 6.

Diameter of the horizontal tubes m P, n R, each being six feet long.		Form of the orifices.	References to Fig. 6.	Diameter of the orifice.	Altitude of the jet when rising vertically, reckoning from m.			Altitude of the jet when inclined a little to the vertical.			Description of the jets.
Inch.	Lines.			Lines.	Feet.	Inch.	Lines.	Feet.	Inch.	Lines.	
3	8	Simple orifice	H	2	10	0	10	10	4	6	The vertical jet beautiful.
3	8	———	G	4	10	5	10	10	7	6	The vertical jet beautiful, not much enlarged at the top.
3	8	———	F	8	10	6	6	10	8	0	All the jets occasionally rise to different heights. This very perceptible in the present experiment. The vertical jet much enlarged at top. The inclined one less so, and more beautiful.
3	8	Conical tube	E	94 by 70	9	6	4	9	8	6	The vertical jet beautiful.
3	8	Cylindrical tube.	D	4 by 70	9	1	6	7	3	6	The vertical jet beautiful.
0	$9\frac{1}{2}$	Simple orifice	M	2	9	11	0	—	—	—	The jet beautiful.
0	$9\frac{1}{2}$	———	L	4	9	7	10	—	—	—	The jet much deformed, and very much enlarged at top.
0	$9\frac{1}{2}$	———	K	8	7	10	0	—	—	—	The column much broken; and the successive jets are detached from each other.

Ratio between the diameters of the tube and the adjutage for producing a maximum height to the jet.

197. It appears, from the three first experiments of the preceding table, that *great jets rise higher than small ones*; and from the three last experiments, that *small jets rise higher than great ones when the horizontal tube is very narrow*. There is therefore a certain proportion between the diameter of the horizontal tube and that of the adjutage or orifice, which will give a maximum height to the jet. This proportion may be found in the following manner. Let D be the diameter of the tube, d that of the adjutage, a the altitude Bm of the reservoir, b the velocity along the tube; and as the velocity at the adjutage is constant, it may be expressed by $\sqrt{a}$. Now, (art. 150. note) the velocity in the tube is to the velocity at the adjutage as the area of their respective sections, that is, as the square of the diameter of the one is to the square of the diameter of the other. Therefore, $\sqrt{a} : b = D^2 : d^2$, and consequently $b = \frac{d^2\sqrt{\alpha}}{D^2}$. If there is another tube and another adjutage, the corresponding quantities may be the same letters in the Greek character, viz. Δ, δ, α, β, and we shall have the equation $\beta = \frac{\delta^2\sqrt{\alpha}}{\Delta^2}$. If we wish, therefore, that the two jets be furnished in the same manner, then if the velocity in the first tube leaves to the first jet all the height possible, the velocity in the second tube leaves also to the second jet all the height possible, and we shall have $b = \beta$, or $\frac{d^2\sqrt{a}}{D^2} = \frac{\delta^2\sqrt{\alpha}}{\Delta^2}$. Hence $D^2 : \Delta^2 = dd\sqrt{a} : \delta\delta\sqrt{\alpha}$, that is, *the squares of the diameters of the horizontal tubes ought to be to one another in the compound ratio of the squares of the diameters of the adjutages, and the square roots of the altitudes of the reser-*

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voir. Now, it appears from the experiments of Mariotte (*Traité de mouvement des eaux*), that when the altitude of the reſervoir is 16 feet, and the diameter of the adjutage ſix lines, the diameter of the horizontal tube ought to be 28 lines and a half. By taking this as a ſtandard, therefore, the diameters of the horizontal tube may be eaſily found by the preceding rule, whatever be the altitude of the reſervoir and the diameter of the adjutage.

It reſults from the three laſt experiments, that the jets riſe to the ſmaller height when the adjutage is a cylindrical tube (ſee D fig. 6.), that a conical adjutage throws the fluid very much higher, and that when the adjutage is a ſimple orifice the jet riſes higheſt of all.

Fig. 6.

198. By comparing the preceding experiments with thoſe of Mariotte, it appears, that *the differences between the heights of vertical jets, and the heights of the reſervoir, are nearly as the ſquares of the heights of the jets.* Thus, $ab : cd = \overline{Eb}^2 : \overline{Fd}^2$; therefore, if ab be known by experiment, we ſhall have $cd = \frac{ab \times \overline{Fd}^2}{\overline{Eb}^2}$, and by adding cd to Fd, we ſhall have the altitude of the reſervoir. But if Fc were given, and it were required to find Fd, the height of the jet, we have, by the preceding analogy, $\overline{Fd}^2 = \frac{\overline{Eb}^2 \times cd}{ab}$. But cd is an unknown quantity, and is equal to $Fc - Fd$, therefore, by ſubſtitution, $\overline{Fd}^2 = \frac{\overline{Eb}^2 \times \overline{Fc - Fd}}{ab}$, or $\overline{Fd}^2 \times \frac{\overline{Eb}^2}{ab} \times \overline{Fd} = \frac{\overline{Eb}^2 \times Fc}{ab}$, which is evidently a quadratic equation, which, after reduction, becomes $Fd = \sqrt{\frac{\overline{Eb}^2 \times Fc}{ab} + \frac{\overline{Eb}^4}{4}} - \frac{\overline{Eb}^2}{2}$.

A ſmall inclination of the jet increaſes its altitude.

199. From a compariſon of the 5th and 6th columns of the table, it appears that a ſmall inclination of the jet, to a vertical line, makes it riſe higher than when it aſcends exactly vertical (K); but even then it ſtill falls ſhort of the height of the reſervoir. When the water firſt eſcapes from the adjutage, it generally ſprings higher than the reſervoir; but this effect is merely momentary, as the jet inſtantly ſubſides, and continues at the altitudes exhibited in the foregoing table. The great ſize of the jet at its firſt formation, and its ſubſequent diminution, have been aſcribed by ſome philoſophers to the elaſticity of the air which follows the water in its paſſage through the orifice; but it is obvious, that this air, which moves along with the fluid, can never give it an impulſive force. In order to explain this phenomenon, let us ſuppoſe the adjutage to be ſtopped; then the air which the water drags along with it, will lodge itſelf at the extremity of the adjutage, ſo that there will be no water contiguous to the body which covers the orifice. As ſoon as the cover is removed from the adjutage, the impriſoned air eſcapes; the water immediately behind it ruſhes into the ſpace which it leaves, and thus acquires in the tube a certain velocity which increaſes at the orifice in the ratio of the area of the ſection of the tube to the area of the ſection of the orifice (art. 150. note). When the orifice is ſmall in compariſon with the tube, the velocity of the iſſuing fluid muſt be conſiderable, and will raiſe it higher than the reſervoir. But as the jet is reſiſted by the air, and retarded by the deſcending fluid, its altitude diminiſhes, and the ſimple preſſure of the fluid becomes the only permanent ſource of its velocity. The preceding phenomenon was firſt noticed by Torricellius *, who ſeems to aſcribe the diminution in the altitude of the jet to the gravity of the deſcending particles.

The jet riſes higher than the reſervoir at its commencement.

* *De Motu Projectorum. Oper. Geomet.* p. 192.

200. The following table exhibits all that is neceſſary in the formation of jets. The two firſt columns are taken from Mariotte †, and ſhew the altitude of the reſervoir requiſite to producing a jet of a certain height. The third column contains, in Paris pints, 36 of which are equal to a cubic foot, the quantity of water diſcharged in a minute by an orifice ſix lines in diameter. The fourth column, computed from the hypotheſis in art. 197. contains the diameters of the horizontal tubes for an adjutage ſix lines in diameter, relative to the altitudes in the ſecond column. The thickneſs of the horizontal tubes will be determined in a ſubſequent ſection.

† *Traité du Mouvement des Eaux*, Part v. diſc. 1. p 393.

TABLE XII. *Containing the Altitudes of Reſervoirs, the Diameters of the Horizontal Tubes, &c. for Jets of different heights.*

Altitude of the jet.	Altitude of the reſervoir.		Quantity of water diſcharged in a minute from an adjutage 6 lines in diam.	Diameters of the horizontal tubes ſuited to the two preceding columns.
Paris Feet.	Feet.	Inches.	Paris Pints.	Lines.
5	5	1	32	21
10	10	4	45	26
15	15	9	56	28
20	21	4	65	31
25	27	1	73	33
30	33	0	81	34
35	39	1	88	36
40	45	4	95	37
45	51	9	101	38
50	58	4	108	39
55	65	1	114	40
60	72	0	120	41
65	79	1	125	42
70	86	4	131	43
75	93	9	136	44
80	101	4	142	45
85	109	1	147	46
90	117	0	152	47
95	125	1	158	48
100	133	4	163	49

201. We have already ſeen that jets do not riſe to the heights of their reſervoirs; and have remarked that the difference between theory and experiment ariſes from the friction at the orifice, and the reſiſtance of the air. The diminution of velocity produced by friction is very ſmall, and the reſiſtance of the air is a very inconſiderable

(K) This was alſo obſerved by Wolfius, *Opera Mathematica*, tom. i. p. 802. Schol. iv.

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conſiderable ſource of retardation, unleſs when the jet riſes to a great altitude. We muſt ſeek therefore for another cauſe of obſtruction to the riſing jet, which when combined with theſe, may be adequate to the effect produced. Wolfius* has very properly aſcribed the diminution in the altitude of the jet to the gravity of the falling water. When the velocity of the foremoſt particles is completely ſpent, thoſe immediately behind by impinging againſt them loſe their velocity, and, in conſequence of this conſtant ſtruggle between the aſcending and deſcending fluid, the jet continues at an altitude leſs than that of the reſervoir. Hence we may diſcover the reaſon why an inclination of the jet increaſes its altitude; for the deſcending fluid falling a little to one ſide does not encounter the riſing particles, and therefore permits them to reach a greater altitude than when their aſcenſion is in a vertical line. Wolfius obſerves, in proof of his remark that the diminution is occaſioned alſo by the weight of the *aſcending* fluid, that mercury riſes to a leſs height than water: but this cannot be owing to the greater ſpecific gravity of mercury; for though the weight of the mercurial particles is greater than that of water, yet the momentum with which they aſcend is proportionally greater, and therefore the reſiſtance which oppoſes their tendency downwards, has the ſame relation to their gravity, as the reſiſtance in the caſe of water has to the weight of the aqueous particles.

* *Wolfii Opera Mathemat.* tom. i. p. 802. ſchol. 4.

Experiments on oblique jets.

202. The theory of oblique jets has already been diſcuſſed in Prop. IX. art. 161. The two following experiments of Boſſut contain all that is neceſſary to be known in practice. When the height NS of the reſervoir AB was 9 feet, and the diameter of the adjutage at N, 6 lines, a vertical abſciſſa CN of 4 feet 3 inches and 7 lines, anſwered to a horizontal ordinate CT of 11 feet 3 inches and 3 lines. When the altitude NS of the reſervoir was 4 feet, the adjutage remaining the ſame, a vertical abſciſſa CN of 4 feet 3 inches and 7 lines, correſponded with a horizontal ordinate CT of 8 feet 2 inches and 8 lines. The real amplitudes, therefore, are leſs than thoſe deduced from theory; and both are very nearly as the ſquare roots of the altitudes of the reſervoirs. Hence, to find the amplitude of a jet when the height of the reſervoir is 10 feet, and the vertical abſciſſa the ſame, we have $\sqrt{9}$ feet : $\sqrt{16}$ feet $=$ 11 feet 3 inches 3 lines : 15 feet 4 lines, the amplitude of the jet required. This rule, however, will apply only to ſmall reſervoirs; for when the jets enlarge, the curve which they deſcribe cannot be determined by theory, and therefore the relation between the amplitudes and the heights of the reſervoirs muſt be uncertain.

Plate CCLXVIII. Fig. 2.

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Sect. V. *Experiments on the Motion of Water in Conduit Pipes.*

203. The experiments of the chevalier de Buat, will be given at great length in the article *Water-Works*, for which we have been indebted to the late learned Dr Robiſon. That the reader, however, may be in poſſeſſion of every thing valuable on a ſubject of ſuch public importance, we ſhall at preſent give a conciſe view of the experiments of Couplet and Boſſut, and of the practical concluſions which they authorize us to form.

204. It muſt be evident to every reader, that, when water is conducted from a reſervoir by means of a long horizontal pipe, the velocity with which the water enters the pipe will be much greater than the velocity with which it iſſues from its farther extremity; and, that if the pipe has various flexures or bendings, the velocity with which the water leaves the pipe will be ſtill farther diminiſhed. The difference, therefore, between the initial velocity of the water, and the velocity with which it iſſues, will increaſe with the length of the pipe and the number of its flexures. By means of the theory, corrected by the preceding experiments, it is eaſy to determine with great accuracy the initial velocity of the water, or that with which it enters the pipe; but on the obſtructions which the fluid experiences in its progreſs through the pipe, and on the cauſes of theſe obſtructions, theory throws but a feeble light. The experiments of Boſſut afford much inſtruction on this ſubject; and it is from them that we have arranged the following table, containing the quantities of water diſcharged by pipes of different lengths and diameters, compared with the quantities diſcharged from additional tubes.

Table

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TABLE XIII.—*Containing the Quantities of Water difcharged by Conduit Pipes of different lengths and diameters, compared with the Quantities difcharged from additional tubes inferted in the fame Refervoir.*

Conftant altitude of the water in the refervoir above the axis of the tube.	Length of the conduit Pipes.	Quantity of water difcharged in a minute by an additional tube.	Quantity of water difcharged by the conduit pipe in a minute	Ratio between the quantities of water furnifhed by the tube and the pipe of 16 lines diameter.	Quantity of water difcharged by an additional tube in a minute.	Quantity of water difcharged by the conduit pipe in a minute.	Ratio between the quantities of water furnifhed by the tube and the pipe of 24 lines diameter.
		Tube and pipe 16 lines diam.			Tube and pipe 24 lines diam.		
Feet.	Feet.	Cubic Inches.	Cubic Inches		Cubic Inches.	Cubic Inches.	
1	30	6330	2778	1 to .4389	14243	7680	1 to .5392
1	60	6330	1957	1 to .3091	14243	5564	1 to .3906
1	90	6330	1587	1 to .2507	14243	4534	1 to .3183
1	120	6330	1351	1 to .2134	14243	3944	1 to .2769
1	150	6330	1178	1 to .1861	14243	3486	1 to .2448
1	180	6330	1052	1 to .1662	14243	3119	1 to .2190
2	30	8939	4066	1 to .4548	20112	11219	1 to .5578
2	60	8939	2888	1 to .3231	20112	8190	1 to .4072
2	90	8939	2352	1 to .2631	20112	6812	1 to .3387
2	120	8939	2011	1 to .2250	20112	5885	1 to .2926
2	150	8939	1762	1 to .1971	20112	5232	1 to .2601
2	180	8939	1583	1 to .1770	20112	4710	1 to .2341
1	2	3	4	5	6	7	8

Deductions from the preceding table. 205. The third column of the preceding table contains the quantity of water difcharged through an additional cylindrical tube 16 lines in diameter, or the quantity difcharged from the refervoir into a conduit pipe of the fame diameter; and the fourth column contains the quantity difcharged by the conduit pipe. The fifth column therefore, which contains the ratio between thefe quantities, will alfo contain the ratio between the velocity of the water at its entrance into the conduit pipe, which we fhall afterwards call its initial velocity, and its velocity when it iffues from the pipe, which fhall be denominated its final velocity; for the velocities are as the quantities difcharged, when the orifices are the fame. The fame may be faid of the 6th, 7th, and 8th columns, with this difference only, that they apply to a cylindrical tube and a conduit pipe 24 lines in diameter.

Caufe of the retardation of water in moving pipes. 206. By examining fome of the experiments in the foregoing table, it will appear, that the water fometimes lofes $\frac{8}{10}$ths of its initial velocity. The velocity thus loft is confumed by the friction of the water on the fides of the pipe, as the quantities difcharged, and confequently the velocities, diminifh when the length of the pipe is increafed. In fimple orifices, the friction is in the inverfe ratio of their diameter; and it appears from the table, that the velocity of the water is more retarded in the pipe 16 lines in diameter, than in the other, which has a diameter of 24 lines. But though the velocity decreafes when the length of the tube is increafed, it by no means decreafes in a regular arithmetical progreffion, as fome authors have maintained. This is obvious from the table, from which it appears, that the differences between the quantities difcharged, which reprefent alfo the differences between the velocities, always *decreafe*, whereas the differences would have been *equal*, had the velocities decreafed in an arithmetical progreffion. The fame truth is capable of a phyfical explanation. If every filament of the fluid rubbed againft the fides of the conduit pipe, then, fince in equal times they all experience the fame degree of friction, the velocities muft diminifh in the direct ratio of the lengths of the tubes, and will form a regular arithmetical progreffion, of which the firft term will be the final, and the laft the initial velocity of the water. But it is only the lateral filaments that are expofed to friction. This retards their motion; and the adjacent filaments which do not touch the pipe, by their adhefion to thofe which do touch it, experience alfo a retardation, but in a lefs degree, and go on with the reft, each filament fuftaining a diminution of velocity inverfely proportional to its diftance from the fides of the pipe. The lateral filaments alone, therefore, provided they always remain in contact with the fides of the pipe, will have their velocities diminifhed in arithmetical progreffion, while the velocities of the central filaments will not decreafe in a much flower progreffion; confequently, the mean velocity of the fluid, or that to which the quantities difcharged are proportional, will decreafe *lefs* rapidly than the terms of an arithmetical progreffion.

The retardation diminifhes as the altitude of the refervoir increafes. 207. When the altitude of the refervoir was two feet, the diminution of difcharge, and confequently of velocity, was greater than when the height of the refervoir was only one foot. The caufe of this is manifeft. Friction increafes with the velocity, becaufe a greater number of obftructions are encountered in a certain time, and the velocities are as the fquare roots of the altitudes; therefore friction muft alfo be as the fquare roots of the altitudes of the refervoir. On fome occafions Coulomb found that the friction of folid bodies diminifhed with an augmentation of velocity, but there is no ground for

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In inclined pipes the velocity of the fluid is increased by its relative gravity.

Plate CCLXVIII. Fig. 7.

for supposing that this takes place in the case of fluids.

208. When the pipe is inclined to the horizon, as CGF, the water will move with a greater velocity than in the horizontal tube CG *hf*. In the former case, the relative gravity of the water, which is to its absolute gravity as F*f* to C*f*, or as the height of the inclined plane to its length, accelerates its motion along the tube. But this acceleration takes place only when the inclination is considerable; for if the angle which the direction of the pipe forms with the horizon were no more than one degree, the retardation of friction would completely counterbalance the acceleration of gravity. Thus when the pipe CF, 16 lines in diameter, was 177 feet, and was divided into three equal parts in the points D and E, so that CD was 59 feet, CE 118 feet; and when CF was to F*f* as 2124 to 241, the quantity of water discharged at F was 5795 cubic inches in a minute, the quantity discharged at E was 5801 cubic inches in a minute, and the quantity at D 5808 cubic inches. The quantities discharged therefore, and consequently the velocities, decreased from C to F; whereas if there had been no friction, and no adhesion between the aqueous particles, the velocities would have increased along the line CF in the subduplicate ratio of the altitudes CB, D*m*, E*n*, and F*o*; AB being the surface of the water in the reservoir. The preceding numbers, representing the quantities discharged at F, E, and D, decrease very slowly; consequently by increasing the relative gravity of the water, that is, by inclining the tube more to the horizon, the effects of friction may be exactly counterbalanced. This happens when the angle *f*CF is about 6° 31′, or when F*f* is the eighth or ninth part of CF. The quantities discharged at C, D, E, and F, will be then equal, and friction will have consumed the velocity arising from the relative gravity of the included water.

Friction destroys this increase of velocity when the inclination of the pipe is 6° 31′.

209. In order to determine the effects produced by flexures or sinuosities in conduit pipes, M. Bossut made the following experiments.

TABLE XIV. *Shewing the Quantities of Water discharged by rectilineal and curvilineal Pipes 50 Feet long, and 1 Inch in Diameter.*

Experiments with curvilineal pipes.

Altitude of the Water in the Reservoir.		Form of the conduit Pipes.—See Figures 8. and 9.	Quantities of Water discharged in a Minute.
Feet.	Inches.		Cubic Inches.
0	4	The rectilineal tube MN placed horizontally,	576
1	0	The same tube similarly placed,	1050
0	4	The same tube bent into the curvilineal form ABC, fig. 8. each flexure lying flat on a horizontal plane, ABC being a horizontal section,	540
1	0	The same tube similarly placed,	1030
0	4	The same tube placed as in fig. 9. where ABCD is a vertical section, the parts A, B, C, D rising above a horizontal plane, and the parts *a*, *b*, *c* lying upon it,	520
1	0	The same tube similarly placed,	1028

210. 1. The two first experiments of the foregoing table shew, that the quantities discharged diminish as the altitude of the reservoir. This arises from an increase of velocity, which produces an increase of friction.

2. The four first experiments shew, that a curvilineal pipe, in which the flexures lie horizontally, discharges less water than a rectilineal pipe of the same length. The friction being the same in both cases, this difference must arise from the impulse of the fluid against the angles of the tube; for if the tube formed an accurate curve, it is demonstrable that the curvature would not diminish the velocity of the water.

3. By comparing the 1st and 5th, and the 2d and 6th experiments, it appears, that when the flexures are vertical, the quantity discharged is diminished. This also arises from the imperfection of curvature.

4. It appears from a comparison of the 3d and 5th, with the 4th and 6th experiments, that when the flexures are vertical the quantity discharged is less than when they are horizontal. In the former case, the motion of the fluid arises from the central impulsion of the water, retarded by its gravity in the ascending parts of the pipe, and accelerated in the descending parts; whereas the motion, in the latter case, arises wholly from the central impulsion of the fluid. To these points of difference the diminution of velocity may somehow or other be owing.

When a large pipe has a number of contrary flexures, the air sometimes mixes with the water, and occupies the highest parts of each flexure as at B and C, fig. 9. By this means the velocity of the fluid is greatly retarded, and the quantities discharged much diminished. This ought to be prevented by placing small tubes at B and C, having a small valve at their top. Fig. 9.

Experiments of Couplet.

211. A set of valuable experiments on a large scale were made by M. Couplet upon the motion of water in conduit pipes, and are detailed in the Memoirs of the Academy for 1732, in his paper entitled *Des Recherches sur le mouvement des eaux dans les tuyaux de conduite.* These experiments are combined with those of the Abbé Bossut in the following table, which gives a distinct view of all that they have done on this subject, and will be of great use to the practical hydraulist.

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Table containing the reſults of the experiments of Couplet and Boſſut on conduit pipes of various kinds.

TABLE XV. *Containing the reſults of the Experiments of Couplet and Boſſut on Conduit Pipes differing in form, length, diameter, and in the materials of which they are compoſed,—under different Altitudes of water in the Reſervoir.*

Altitude of the Water in the Reſervoir.			Length of the Conduit Pipe.	Diameter of the Conduit Pipes.	Nature, Poſition, and Form of the Conduit Pipes.	Ratio between the Quantities which would be diſcharged if the Fluid experienced no reſiſtance in the pipes, and the Quantities actually diſcharged;—or the Ratio between the initial and the final Velocities of the Fluid.
Feet.	Inch.	Lines.	Feet.	Lines.		
0	4	0	50	12	Rectilineal and horizontal pipe made of lead,	1 to 0.281
1	0	0	50	12	The ſame pipe ſimilarly placed,	1 to 0.305
0	4	0	50	12	The ſame pipe with ſeveral horizontal flexures,	1 to 0.264
1	0	0	50	12	Same pipe,	1 to 0.291
0	4	0	50	12	The ſame pipe with ſeveral vertical flexures,	1 to 0.254
1	0	0	50	12	Same pipe,	1 to 0.290
1	0	0	180	16	Rectilineal and horizontal pipe made of white iron,	1 to 0.166
2	0	0	180	16	Same pipe,	1 to 0.177
1	0	0	180	24	Rectilineal and horizontal pipe made of white iron,	1 to 0.218
2	0	0	180	24	Same pipe,	1 to 0.234
20	11	0	177	16	Rectilineal pipe made of white iron, and inclined ſo that CF (fig. 7.) is to F*f* as 2124 is 241,	1 to 0.2000
13	4	8	118	16	Rectilineal pipe made of white iron, and inclined like the laſt,	1 to 0.2500
6	8	4	159	16	Rectilineal pipe made of white iron, and inclined like the laſt,	1 to 0.354
0	9	0	1782	48	Conduit pipe almoſt entirely of iron, with ſeveral flexures both horizontal and vertical,	1 to 0.350
1	9	0	1782	48	Same pipe,	1 to 0.0376
2	7	0	1782	48	Same pipe,	1 to 0.0387
0	3	0	1710	72	Conduit pipe almoſt entirely of iron, with ſeveral flexures both horizontal and vertical,	1 to 0.0809
0	5	3	1710	72	Same pipe,	1 to 0.0878
0	5	7	7020	60	Conduit pipe, partly ſtone and partly lead, with ſeveral flexures both horizontal and vertical,	1 to 0.0432
0	11	4	7020	60	Same pipe,	1 to 0.0476
1	4	9	7020	60	Same pipe,	1 to 0.0513
1	9	1	7020	60	Same pipe,	1 to 0.0532
2	1	0	7020	60	Same pipe,	1 to 0.0541
12	1	3	3600	144	Conduit pipe made of iron, with flexures both horizontal and vertical,	1 to 0.0992
12	1	3	3600	216	Conduit pipe made of iron, with ſeveral flexures both horizontal and vertical,	1 to 0.1653
4	7	6	4740	216	Conduit pipe made of iron, with ſeveral flexures both horizontal and vertical,	1 to 0.0989
20	3	0	14040	144	Conduit pipe made of iron, with ſeveral flexures both horizontal and vertical,	1 to 0.0517

Application and uſe of the preceding table.

212. In order to ſhew the application of the preceding reſults, let us ſuppoſe, that a ſpring, or a number of ſprings combined, furniſhes 40,000 cubic inches of water in one minute; and that it is required to conduct it to a given place 4 feet below the level of the ſpring, and ſo ſituated that the length of the pipe muſt be 2400 feet. It appears from Table VI. art. 185. that the quantity of water furniſhed in a minute by a ſhort cylindrical tube, when the altitude of the fluid in the reſervoir is 4 feet, is 7070 cubic inches; and ſince the quantities furniſhed by two cylindrical pipes under the ſame altitude of water are as the ſquares of their diameters, we ſhall have by the following analogy the diameter of the tube neceſſary for diſcharging 40,000 cubic inches in a minute; $\sqrt{70720} : \sqrt{40000} = 12$ lines or 1 inch : 28.$\frac{1}{2}$ lines, the diameter required. But by comparing ſome of the experiments in the preceding table, it appears, that when the length of the pipe is nearly 2400 feet, it will admit only about one-eighth of the water, that is, about 5000 cubic inches. That the pipe, however, may tranſmit the whole 40000 cubic inches, its diameter muſt be increaſed. The following analogy, therefore, will furniſh us with this new diameter; $\sqrt{5000} : \sqrt{40000} = 28.54$ lines : 80.73 lines, or 6 inches $8\frac{7}{10}$

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$8\frac{7}{10}$ lines, the diameter of the pipe which will discharge 40000 cub. inches of water when its length is 2400 feet.

SECT. VI. *Experiments on the Pressure exerted upon Pipes by the water which flows through them.*

Experiments on the pressure sustained by pipes.

213. The pressure exerted upon the sides of conduit pipes by the included water, has been already investigated theoretically in Prop. X. Part II. The only way of ascertaining by experiment the magnitude of this lateral pressure is to make an orifice in the side of the pipe, and find the quantity of water which it discharges in a given time. This lateral pressure is the force which impels the water through the orifice; and therefore the quantity discharged, or the effect produced, must be always proportional to that pressure as its producing cause, and may be employed to represent it. The following table, founded on the experiments of Bossut, contains the quantities of water discharged from a lateral orifice about $3\frac{1}{4}$ lines in diameter, according to theory and experiment.

TABLE XVI. *Containing the Quantities discharged by a Lateral Orifice, or the Pressures on the Sides of Pipes, according to Theory and Experiment.*

Altitude of the Water in the Reservoir.	Length of the Conduit Pipe.	Quantities of Water discharged in 1 Minute, according to Theory.	Quantities of Water discharged in 1 Minute according to Experiment.
Feet.	Feet.	Cubic Inches.	Cubic Inches.
1	30	176	171
1	60	186	186
1	90	190	190
1	120	191	191
1	150	192	193
1	180	193	194
2	30	244	240
2	60	259	256
2	90	264	261
2	120	267	264
2	150	268	265
2	180	269	266

It appears from the preceding table, that the real lateral pressure in conduit pipes differs very little from that which is computed from the formula; but in order that this accordance may take place, the orifice must be so perforated, that its circumference is exactly perpendicular to the direction of the water, otherwise a portion of the water discharged would be owing to the direct motion of the included fluid.

SECT. VII. *Experiments on the Motion of Water in Canals.*

Experiments on the velocity of water in horizontal canals.

214. AMONG the numerous experiments which have been made on this important subject, those of the Abbé Bossut seem entitled to the greatest confidence. His experiments were made on a rectangular canal 105 feet long long, 5 inches broad at the bottom, and from 8 to 9 inches deep. The orifice which transmitted the water from the reservoir into the canal was rectangular, having its horizontal base constantly 5 inches, and its vertical height sometimes half an inch, and at other times an inch. The sides of this orifice were made of copper, and rising perpendicularly from the side of the reservoir they formed two vertical planes parallel to each other. This projecting orifice was fitted into the canal, which was divided into 5 equal parts of 21 feet each, and also into 3 equal parts of 35, and the time was noted which the water employed in reaching these points of division. The arrival of the water at these points was signified by the motion of a very small water wheel placed at each, and impelled by the stream. When the canal was horizontal, the following results were obtained.

TABLE XVII. *Containing the Velocity of Water in a Rectangular Horizontal Canal 105 Feet long, under different Altitudes of Fluid in the Reservoir.*

Altitude of the water in the reservoir.	*Ft.* *In.* 11 8	*Ft.* *In.* 7 8	*Ft.* *In.* 3 8	*Ft.* *In.* 11 8	*Ft.* *In.* 7 8	*Ft.* *In.* 3 8	Space run through by the water.
Vertical breadth of the orifice.	½ an inch	½ an inch.	½ an inch.	1 inch.	1 inch.	1 inch.	*Feet.*
Time in which the number of feet in column seventh are run through by the water.	2″	3″—	3″+	2″	2″+	3″—	21
	5—	7	9	4	5	6+	42
	10—	13—	17+	7	9	11+	63
	16—	20—	27+	11	14	18+	84
	23+	28+	38+	$16\frac{1}{4}$	20	26	105

Deductions from the preceding experiments.

215. It appears from column 1st, that the times successively employed to run through spaces of 21 feet each, are as the numbers 2, 3—, 5, 6, 7+, which form nearly an arithmetical progression, whose terms differ nearly by 1, so that by continuing the progression we may determine very nearly the time in which the fluid would run through

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through any number of feet not contained in the 7th column. The ſame may be done with the other columns of the table.

If we compute theoretically the time whichthe water ſhould employ in running through the whole length of the canal, or 105 feet, we ſhall find, that under the circumſtances for each column of the preceding table the times, reckoning from the firſt column, are 6″.350, 7″.834, 11.″330, 6″.350, 7″.834, 11″330. It appears, therefore, by comparing theſe times with thoſe found by experiment, that the velocity of the ſtream is very much retarded by friction, and that this retardation is leſs as the breadth of the orifice is increaſed; for ſince a greater quantity of water iſſues in this caſe from the reſervoir, it has more power to overcome the obſtacles which obſtruct its progreſs. The ſigns + and — affixed to the numbers in the preceding table indicate, that theſe numbers are a little too great or too ſmall.

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Experiments on the velocity of water in inclined canals.

216. The following experiments were made on inclined canals with different declivities, and will be of great uſe to the practical hydrauliſt. The inclination of the canal is the vertical diſtance of one of its extremities from a horizontal line which paſſes through its other extremity.

Table of the velocity of water in rectangular inclined canals.

TABLE XVIII. *Containing the Velocity of Water in a Rectangular inclined Canal 105 Feet long, and under different Altitudes of Fluid in the Reſervoir.*

Altitude of water in the reſervoir.	*Ft. In.* 11 8	*Ft. In.* 7 8	*Ft. In.* 3 8	*Ft. In.* 11 8	*Ft. In.* 7 8	*Ft. In.* 3 8	Space run through by the Water.
Inclination of the canal.	*Ft. In.* 0 3	*Ft. In.* 0 3	*Ft. In.* 0 3	*Ft. In.* 0 6	*Ft. In.* 0 6	*Ft. In.* 0 6	*Feet.*
Height of the orifice ½ an inch.	4″ 11+ 22	4″+ 14+ 26	6″+ 18+ 34+	3″½ 11½ 21	4+ 14 25+	6 18— 31+	35 70 105
Inclination of the canal.	*Ft. In.* 0 6	*Ft. In.* 0 6	*Ft. In.* 0 6	*Ft. In.* 1 0	*Ft. In.* 1 0	*Ft. In.* 1 0	
Height of the orifice 1 inch.	3″ 8 15	4″— 9+ 19—	5″— 13— 23—	3″— 7½ 14	4″— 9 16	5— 12 21	35 70 105
Inclination of the canal.	*Ft. In.* 2 0	*Ft. In.* 2 0	*Ft. In.* 2 0	*Ft. In.* 4 0	*Ft. In.* 4 0	*Ft. In.* 4 0	
Height of the orifice 1 inch.	2″+ 7 13	4″— 9— 15—	4″ 10½ 17½	2″+ 6½ 12	3″+ 8 13	4+ 9+ 15+	35 70 105
Inclination of the canal.	*Ft. In.* 6 0	*Ft. In.* 6 0	*Ft. In.* 6 0	*Ft. In.* 9 0	*Ft. In.* 9 0	*Ft. In.* 9 0	
Height of the orifice 1 inch.	2″+ 6 10	3″ 7+ 12	4″ 9— 14—	2″+ 6— 9	3″+ 6½ 10	4″— 8— 12—	35 70 105
Inclination of the canal.	*Feet.* 11	*Feet.* 11	*Feet.* 11	*Feet.* 11	*Feet.* 11	*Feet.* 11	
In the three firſt columns the height of the orifice was ½ an inch, and in the three laſt 1 inch.	*Half ſec.* 2+ 7 12 17 21+	*Half ſec.* 3+ 8+ 13+ 18+ 23+	*Half ſec.* 4+ 10 16 22 28	*Half ſec.* 2 5 9 13 17	*Half ſec.* 3+ 7 11 15 19	*Half ſec.* 3 8 13 18— 22	21 42 63 84 105
Inclination of the canal.	*Feet.* 11	*Feet.* 11	*Feet.* 11				
Height of the orifice 1½ inches.	*Half ſec.* 2 5 8+ 12 15+	*Half ſec.* 3— 6 10— 13+ 17	*Half ſec.* 3+ 7 11+ 15 20				21 42 63 84 105

Time in which the number of feet in the laſt col. is run through by the water.

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The velocity of the firſt portion of water that iſſues from the reſervoir is leſs than that of the eſtabliſhed current. Boſſut aſcribes this difference to a diminution of friction.

217. In the preceding experiments the velocity of the firſt portion of water that iſſues from the reſervoir was only obſerved; but when the current is once eſtabliſhed, and its velocity permanent, it moves with greater rapidity, and there is always a fixed proportion between the velocity of the firſt portion of water and the permanent velocity of the eſtabliſhed current. The cauſe of this difference Boſſut does not ſeem to have thoroughly comprehended, when he aſcribes it to a diminution of friction when the velocity becomes permanent. The velocity of the firſt portion of water that iſſues from the reſervoir was meaſured by its arrival at certain diviſions of the canal, conſequently the velocity thus determined was the *mean* velocity of the water. The velocity of the eſtabliſhed current, on the contrary, was meaſured by light bodies floating upon its ſurface, at the centre of the canal, therefore the velocity thus determined was the *ſuperficial* velocity of the ſtream. But the velocity of the ſuperficial central filaments muſt be the greateſt of all, becauſe being at the greateſt diſtance from the ſides and bottom of the canal they are leſs affected by friction than any of the adjacent or inferior filaments, and are not retarded by the weight of any ſuperincumbent fluid. The *ſuperficial* velocity of the current muſt of conſequence be greater than its *mean* velocity, or, in other words, the velocity of the eſtabliſhed current muſt exceed the velocity of the firſt portion of water. The following table contains the experiments of Boſſut on this ſubject; the canal being of the ſame ſize as in the former experiments, but 600 feet long, and its inclination one-tenth of the whole, or 59.702 feet.

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It is owing to a different cauſe; the *ſuperficial* velocity having been meaſured in the one caſe, and only the mean velocity in the other.

TABLE XIX. *Containing a Compariſon between the Velocity of the Firſt Portion of Water, and that of the Eſtabliſhed Current.*

Altitude of the water in the reſervoir.		Vertical breadth of the orifice 1 inch.		Vertical breadth of the orifice 2 inches.		Space run through by the water.
		Vel. of the 1ſt portion of water.	Vel. of the eſtabliſhed current.	Vel. of the 1ſt portion of water.	Vel. of the eſtabliſhed current.	
Feet	Inches	Seconds.	Seconds.	Seconds.	Seconds.	Feet.
4	0	10	8	8	7	100
4	0	20+	17	17	14½	200
4	0	31—	26	26	22	300
4	0	42—	35	35—	29+	400
4	0	52½	43+	43+	37—	500
4	0	62+	52	52—	44+	600
2	0	11	10	9	8—	100
2	0	23	20	19	16	200
2	0	35	30	29	24	300
2	0	46+	40	39	32	400
2	0	58	49	49	40	500
2	0	69	58	58	48	600
1	0	12+	12	15	13	100
1	0	25½	23+	31	26½	200
1	0	39	33	47	39½	300
0	6	11—	9	13¼	11½	100
0	6	22	18—	26¼	23	200
0	6	32	27	39½	33½	300

The common theory of the motion of fluids defective in not conſidering the temperature of the water employed.

218. In all the experiments related in this chapter, and in thoſe of the Chevalier Buat, which are given in the article *WATER-Works*, the temperature of the water employed has never been taken into conſideration. That the fluidity of water is increaſed by heat can ſcarcely admit of a doubt. Profeſſor Leſlie, in his ingenious paper on Capillary Action, has proved by experiment that a jet of warm water will ſpring much higher than a jet of cold water, and that a ſyphon which diſcharges cold water only by drops, will diſcharge water of a high temperature in a continued ſtream. A ſimilar fact was obſerved by the ancients. Plutarch (L) in particular aſſures us, that the clepſydræ or water clocks went ſlower in winter than in ſummer, and he ſeems to attribute this retardation to a diminution of fluidity. It is therefore obvious, that warm water will iſſue from an aperture with greater velocity than cold water, and that the quantities of fluid diſcharged from the ſame orifice, and under the ſame preſſure, will increaſe with the temperature of the fluid. Hence we many diſcover the cauſe of the great diſcrepancy between the experiments of different philoſophers on the motion of fluids.

Warm water moves faſter than cold water.

(L) Ελαυνεσα γαρ ἡ ψυχροτης το ὑδωρ ποιει βαρυ και σωματῶδες, ως εστιν εν ταις κλεψυδραις καταμαθειν, βραδιον γαρ ἑλκεσι χειμωνος ἡ θερες. *Aquam enim impellens frigus gravem facit et craſſam, quod in clepſydris licet obſervare: tardius enim trahunt hyeme quam æſtate.* PLUTARCH, *Queſt. Natural.*

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fluids. Their experiments were performed in different climates and at different seasons of the year; and, as the temperature of the water would be variable from these and from other causes, a variation in their results was the inevitable consequence.

Experiments for determining the effects of heat on the motion of fluids.

219. The writer of this article has a set of experiments in view, by which he expects to determine the precise effects of heat upon the motion of fluids, and to furnish the practical hydraulist with a more correct formula than that of the Chevalier Buat, for finding, under any given circumstances, the velocity of water and the quantities discharged. He hopes also to be able to determine whether or not the friction of water in conduit pipes varies, as in the case of solid bodies, with the nature of the substances of which the pipes are formed; and to ascertain the effects of different unguents in diminishing the resistance of friction. The result of these experiments will probably be communicated in a subsequent article of this work.

Chap. III. *On the Resistance of Fluids.*

Reference to the article Resistance *of Fluids.*

220. In the article Resistance *of Fluids*, the reader will find that important subject treated at great length, and with great ability, by the late learned Dr Robison. The researches of preceding philosophers are there given in full detail; their different theories are compared with experiments, and the defects of these minutely considered. Since that article was composed, this intricate subject has been investigated by other writers, and though they have not enriched the science of hydraulics with a legitimate theory of the resistance of fluids, the results of their labours cannot fail to be interesting to every philosopher.

Researches of Coulomb.

221. The celebrated Coulomb has very successfully employed the principle of torsion, to determine the cohesion of fluids, and the laws of their resistance in very slow motions. His experiments are new, and were performed with the greatest accuracy; and the results which he obtained were perfectly conformable to the deductions of theory. We shall therefore endeavour to give the reader some idea of the discoveries which he has made.

222. When a body is struck by a fluid with a velocity exceeding eight or nine inches per second, the resistance has been found proportional to the square of the velocity, whether the body in motion strikes the fluid at rest, or the body is struck by the moving fluid. But when the velocity is so slow as not to exceed four-tenths of an inch in a second, the resistance is represented by two terms, one of which is proportional to the simple velocity, and the other to the square of the velocity. The first of these sources of resistance arises from the cohesion of the fluid particles which separate from one another, the number of particles thus separated being proportional to the velocity of the body. The other cause of resistance is the inertia of the particles, which when struck by the fluid, acquire a certain degree of velocity proportional to the velocity of the body; and as the number of these particles is also proportional to that velocity, the resistance generated by their inertia must be proportional to the square of the velocity.

223. When Sir Isaac Newton * was determining the resistance which the air opposed to the oscillatory motion of a globe in small oscillations, he employed a formula of three terms, one of them being as the square of the velocity, the second the $\frac{3}{2}$ power of the velocity, and the third as the simple velocity; and in another part of the work he reduces the formula to two terms, one of which is as the square of the velocity, and the other constant. D. Bernouilli (*Comment. Petropol.* tom. iii. and v.) also supposes the resistance to be represented by two terms, one as the square of the velocity, and the other constant. M. Gravesende (*Elements of Nat. Phil.* art. 1911), has found that the pressure of a fluid in motion against a body in rest, is partly proportional to the simple velocity, and partly to the square of the velocity. But when the body moves in a fluid at rest, he found (art. 1975) the resistance proportional to the square of the velocity, and to a constant quantity.—When the *body in motion therefore, meets the fluid at rest*, these three philosophers have agreed, that the formula which represents the resistance of fluids consists of two terms, one of which is as the square of the velocity, and the other constant. The experiments of Coulomb, however, incontestably prove, that the pressure which the moving body in this case sustains, is represented by two terms, one proportional to the simple velocity, and the other to its square, and that if there is a constant quantity, it is so very small as to escape detection.

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* *Principia.* lib. ii. prop. xl.

Apparatus employed in Coulomb's experiments. Plate CCLXIX. Fig. 1.

224. In order to apply the principle of torsion to the resistance of fluids, M. Coulomb made use of the apparatus represented in fig. 1. On the horizontal arm LK, which may be supported by a vertical stand, is fixed the small circle *f e*, perforated in the centre, so as to admit the cylindrical pin *b a*. Into a slit in the extremity of this pin is fastened, by means of a screw, the brass wire *a g*, whose force of torsion is to be compared with the resistance of the fluid; and its lower extremity is fixed in the same way into a cylinder of copper *g d*, whose diameter is about four-tenths of an inch. The cylinder *g d* is perpendicular to the disc DS, whose circumference is divided into 480 equal parts. When this horizontal disc is at rest, which happens when the torsion of the brass wire is nothing, the index RS is placed upon the point o, the zero of the circular scale. The small rule R *m* may be elevated or depressed at pleasure round its axis *n*, and the stand GH which supports it may be brought into any position round the horizontal disc. The lower extremity of the cylinder *g d* is immersed about two inches in the vessel of water MNOP, and to the extremity *d* is attached the planes, or the bodies whose resistance is to be determined when they oscillate in the fluid by the torsion of the brass wire. In order to produce these oscillations, the disc DS, supported by both hands, must be turned gently round to a certain distance from the index, without deranging the vertical position of the suspended wire. The disc is then left to itself; the force of torsion causes it to oscillate, and the successive diminution of these oscillations are carefully observed. A simple formula gives in weights the force of torsion that produces the oscillations; and another formula well known to geometers, determines (by an approximation sufficiently accurate in practice), by means of the successive diminution of the oscillations compared with their amplitude, what is the law of the resistance, relative to the velocity, which produces these diminutions.

Method of using it.

The

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The method adopted by Coulomb resembles that employed by Newton and other philosophers who observed the oscillations of a pendulum in resisting media.

225. The method employed by Coulomb, in reducing his experiments, is similar to that adopted by Newton and other mathematicians, when they wished to determine the resistance of fluids, from the successive diminutions of the oscillations of a pendulum moving in a resisting medium; but is much better fitted for detecting the small quantities which are to be estimated in such researches. When the pendulum is employed, the specific gravity of the body, relative to that of the fluid, must be determined; and the least error in this point leads to very uncertain results. When the pendulum is in different points of the arc in which it oscillates, the wire or pendulum rod is plunged more or less in the fluid; and the alterations which may result from this are frequently more considerable than the small quantities which are the object of research. It is only in small oscillations, too, that the force which brings the pendulum from the vertical, is proportional to the angle which the pendulum rod, in different positions, forms with this vertical line; a condition which is necessary before the formulæ can be applied. But small oscillations are attended with great disadvantages; and their successive diminutions cannot be determined but by quantities which it is difficult to estimate exactly, and which are changed by the smallest motion either of the fluid in the vessel, or of the air in the chamber. In small velocities, the pendulum rod experiences a greater resistance at the point of floatation than at any other part. This resistance, too, is very changeable; for the water rises from its level along the pendulum rod to greater or less heights, according to the velocity of the pendulum.

Disadvantages of a pendulum.

Advantages of comparing the resistance of fluids with the force of torsion.

226. These and other inconveniences which might be mentioned, are so inseparable from the use of the pendulum, that Newton and Bernouilli have not been able to determine the laws of the resistance of fluids in very slow motions. When the resistance of fluids is compared with the force of torsion, these disadvantages do not exist. The body is in this case entirely immersed in the fluid; and as every point of its surface oscillates in a horizontal plane, the relation between the densities of the fluid and the oscillating body has no influence whatever on the moving force. One or two circles of amplitude may be given to the oscillations; and their duration may be increased at pleasure, either by diminishing the diameter of the wire, or increasing its length; or, which may be more convenient, by augmenting the momentum of the horizontal disc. Coulomb, however, found that when each oscillation was so long as to continue about 100 seconds, the least motion of the fluid, or the tremor occasioned by the passing of a carriage, produced a sensible alteration on the results. The oscillations best fitted for experiments of this kind, continued from 20 to 30 seconds, and the amplitude of those that gave the most regular results, was comprehended between 480 degrees, the entire division of the disc, and 8 or 10 divisions reckoned from the zero of the scale. From these observations it will be readily seen, that it is only in very slow motions that an oscillating body can be employed for determining the resistance of fluids. In small oscillations, or in quick circular motions, the fluid struck by the body is continually in motion; and when the oscillating body returns to its former position, its velocity is either increased or retarded by the motion communicated to the fluid, and not extinguished.

When the velocity is very small, the part of the resistance proportional to the square of the velocity disappears.

227. In the first set of experiments made by Coulomb, he attached to the lower extremity of the cylinder *g d* a circular plate of white iron, about 195 millimetres in diameter, and made it move so slowly, that the part of the resistance proportional to the square of the velocity, wholly disappeared. For if, in any particular case, the portion of the resistance proportional to the simple velocity, should be equal to the portion that is proportional to the square of the velocity when the body has a velocity of one-tenth of an inch per second; then, when the velocity is 100 tenths of an inch per second, the part proportional to the square of the velocity will be a hundred times greater than that proportional to the simple velocity; but if the velocity is only the 100dth part of the tenth of an inch per second, then the part proportional to the simple velocity will be 100 times greater than the part proportional to the square of the velocity.

Result of Coulomb's experiments on the resistance of water to a horizontal plate moving round its centre in the plane of its superficies.

228. When the oscillations of the white iron plate were so slow, that the part of the resistance which varies with the second power of the velocity was greatly inferior to the other part, he found, from a variety of experiments, that the resistance which diminished the oscillations of the horizontal plate was uniformly proportional to the simple velocity, and that the other part of the resistance, which follows the ratio of the square of the velocity, produced no sensible change upon the motion of the white iron disc.—He found also, in conformity with theory, that the momenta of resistance in different circular plates moving round their centre in a fluid, are as the fourth power of the diameters of these circles; and that, when a circle of 195 millimetres (6.677 English inches) in diameter, moved round its centre in water, so that its circumference had a velocity of 140 millimetres (5.512 English inches) per second, the momentum of resistance which the fluid opposed to its circular motion was equal to one-tenth of a gramme (1.544 English troy grains) placed at the end of a lever 143 millimetres (5.63 English inches) in length.

Similar result obtained in clarified oil.

Ratio between the mutual cohesion of the particles of oil, and the mutual cohesion of the particles of water.

229. M. Coulomb repeated the same experiments in a vessel of clarified oil, at the temperature of 16 degrees of Reaumur. He found, as before, that the momenta of the resistance of different circles, moving round their centre in the plane of their superficies, were as the fourth power of their diameters; and that the difficulty with which the same horizontal plate, moving with the same velocity, separated the particles of oil, was to the difficulty with which it separated the particles of water, as 17.5 to 1, which is therefore the ratio that the mutual cohesion of the particles of oil has to the mutual cohesion of the particles of water.

The resistance not influenced by the nature of the surface of the moving body.

230. In order to ascertain whether or not the resistance of a body moving in a fluid was influenced by the nature of its surface, M. Coulomb anointed the surface of the white iron plate with tallow, and wiped it partly away, so that the thickness of the plate might not be sensibly increased. The plate was then made to oscillate in water, and the oscillations were found to diminish in the same manner as before the application of the unguent. Over the surface of the tallow upon the plate, he afterwards scattered, by means of a sieve, a quantity

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quantity of coarſe ſand which adhered to the greaſy ſurface; but when the plate, thus prepared, was cauſed to oſcillate, the augmentation of reſiſtance was ſo ſmall, that it could ſcarcely be appreciated. We may therefore conclude, that the part of the reſiſtance which is proportional to the ſimple velocity, is owing to the mutual adheſion of the particles of the fluid, and not to the adheſion of theſe particles to the ſurface of the body.

Experiments for finding if the reſiſtance is increaſed by increaſing the ſuperincumbent fluid.

231. If the part of the reſiſtance varying with the ſimple velocity were increaſed when the white iron plate was immerged at greater depths in the water, we might ſuppoſe it to be owing to the friction of the water on the horizontal ſurface, which, like the friction of ſolid bodies, ſhould be proportional to the ſuperincumbent preſſure. In order to ſettle this point, M. Coulomb made the white iron plate oſcillate at the depth of two centimetres (.787 Engliſh inches), and alſo at the depth of 50 centimeters (19.6855 Engliſh inches), and found no difference in the reſiſtance; but as the ſurface of the water was loaded with the whole weight of the atmoſphere, and as an additional load of 50 centimetres of water could ſcarcely produce a perceptible augmentation of the reſiſtance, M. Coulomb employed another method of deciding the queſtion. Having placed a veſſel full of water under the receiver of an air-pump, the receiver being furniſhed with a rod and collar of leather at its top, he fixed to the hook, at the end of the rod, a harpſichord wire, numbered 7 in commerce, and ſuſpended to it a cylinder of copper, like *g d*, fig. 1. which plunged in the water of the veſſel, and under this cylinder he fixed a circular plane, whoſe diameter was 101 millimetres (3.976 Engliſh inches). When the oſcillations were finiſhed, and conſequently the force of torſion nothing, the zero of torſion was marked by the aid of an index fixed to the cylinder. The rod was then made to turn quickly round through a complete circle, which gave to the wire a complete circle of torſion, and the ſucceſſive diminutions of the oſcillations were carefully obſerved. The diminution for a complete circle of torſion was found to be nearly a fourth part of the circle for the firſt oſcillation, but always the ſame whether the experiment was made in a vacuum or in the atmoſphere. A ſmall pallet 50 millimetres long (1.969 Engliſh inches) and 10 millimetres broad, (0.3937 Engliſh inches) which ſtruck the water perpendicular to its plane, furniſhed a ſimilar reſult. We may therefore conclude, that when a ſubmerged body moves in a fluid, the preſſure which it ſuſtains, meaſured by the altitude of the ſuperior fluid, does not perceptibly increaſe the reſiſtance; and conſequently, that the part of this reſiſtance proportional to the ſimple velocity, can in no reſpect be compared with the friction of ſolid bodies, which is always proportional to the preſſure.

On the reſiſtance of cylinders moving perpendicular to their axes.

232. The next object of M. Coulomb was to aſcertain the reſiſtance experienced by cylinders that moved very ſlowly, and perpendicular to their axes; but as the particles of fluid ſtruck by the cylinder neceſſarily partook of its motion, it was impoſſible to neglect the part of the reſiſtance proportional to the ſquare of the velocity, and therefore he was obliged to perform the experiments in ſuch a manner that both parts of the reſiſtance might be computed. The three cylinders which he employed were 249 millimetres (.9803 Engliſh inches) long. The firſt cylinder was 0.87 millimetres (0.0342 Engliſh inches or $\frac{1}{29}$ of an inch) in circumference, the ſecond 11.2 millimetres (.04409 Engliſh inches), and the third 21.1 millimetres (.88307 Engliſh inches). They were fixed by their middle under the cylindrical piece *d g*, ſo as to form two horizontal radii, whoſe length was 124.5 millimetres (.4901 Engliſh inches) or half the length of each cylinder. After making the neceſſary experiments and computations, he found that the part of the reſiſtance proportional to the ſimple velocity, which, to avoid circumlocution, we ſhall call *r*, did not vary with the circumferences of the cylinders. The circumferences of the firſt and third cylinders were to one another as 24 : 1, whereas the reſiſtances were in the ratio of 3 : 1. The ſame concluſion was deduced by comparing the experiments made with the firſt and ſecond cylinder.

The reſiſtance due to the ſimple velocity is not proportional to the circumferences of the cylinders.

233. In order to explain theſe reſults M. Coulomb very juſtly ſuppoſes, that in conſequence of the mutual adheſion of the particles of water, the motion of the cylinder is communicated to the particles at a ſmall diſtance from it. The particles which touch the cylinder have the ſame velocity as the cylinder, thoſe at a greater diſtance have a leſs velocity, and at the diſtance of about one-tenth of an inch the velocity ceaſes entirely, ſo that it is only at that diſtance from the cylinder that the mutual adheſion of the fluid molecules ceaſes to influence the reſiſtance. The reſiſtance *r* therefore ſhould not be proportional to the circumference of the real cylinder, but to the circumference of a cylinder whoſe radius is greater than the real cylinder by one-tenth of an inch. It conſequently becomes a matter of importance to determine with accuracy the quantity which muſt be added to the real cylinder in order to have the radius of the cylinder to which the reſiſtance *r* is proportional, and from which it muſt be computed. Coulomb found the quantity by which the radius ſhould be increaſed, to be 1.5 millimetres ($\frac{59}{1000}$ of an Engliſh inch) ſo that the diameter of the augmented cylinder will exceed the diameter of the real cylinder by double that quantity, or $\frac{118}{1000}$ of an inch.

Cauſe of this.

The reſiſtance due to the *ſimple velocity* is proportional to the circumference of the cylinders when their radii are augmented by $\frac{59}{1000}$ of an inch.

234. The part of the reſiſtance varying with the ſquare of the velocity, or that ariſing from the inertia of the fluid, which we ſhall call R, was likewiſe not proportional to the circumferences of the cylinder; but the augmentation of the radii amounts in this caſe only to $\frac{11}{1000}$ of an inch, which is only one-fifth of the augmentation neceſſary for finding the reſiſtance *r*. The reaſon of this difference is obvious; all the particles of the fluid when they are ſeparated from each other oppoſe the ſame reſiſtance, whatever be their velocity; conſequently as the value of *r* depends only on the adheſion of the particles, the reſiſtances due to this adheſion will reach to the diſtance from the cylinder where the velocity of the particles is 0. In comparing the different values of R, the part of the reſiſtance which varies as the ſquare of the velocity, all the particles are ſuppoſed to have a velocity equal to that of the cylinder; but as it is only the particles which touch the cylinder that have this velocity, it follows that the augmentation of the diameter neceſſary for finding R muſt be leſs than the augmentation neceſſary for finding *r*.

The reſiſtance due to the *ſquare of the velocity* is proportional to the circumferences of the cylinders when their radii are augmented by $\frac{11}{1000}$ of an inch.

Cauſe of this difference.

Relation between the reſiſtance and the diameters of the cylinders.

235. In determining experimentally the part of the momentum of reſiſtance proportional to the velocity, by two cylinders of the ſame diameter, but of different lengths, M. Coulomb found that this momentum was proportional

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proportional to the third power of their lengths. The same result may be deduced from theory; for supposing each cylinder divided into any number of parts, the length of each part will be proportional to the whole length. The velocity of the corresponding parts will be as these lengths, and also as the distance of the same parts from the centre of rotation. The theory likewise proves, that the momentum of resistance depending on the square of the velocity, in two cylinders of the same diameter but of different lengths, is proportional to the fourth power of the length of the cylinder.

Real resistance of a given cylinder.

236. When the cylinder 0.9803 inches in length, and 0.04409 inches in circumference, was made to oscillate in the fluid with a velocity of 5.51 inches per second, the part of the resistance r was equal to 58 milligrammes, or .8932 troy grains. And when the velocity was 0.3937 inches per second, the resistance r was 0.00414 grammes, or 0.637 troy grains.

Result of the preceding experiments when made in oil.

237. The preceding experiments were also made in the oil formerly mentioned; and it likewise appeared, from their results, that the mutual adhesion of the particles of oil was to the mutual adhesion of the particles of water as 17 to 1. But though this be the case, M. Coulomb discovered that the quantity by which the radii of the cylinder must be augmented in order to have the resistance r, is the very same as when the cylinder oscillated in water. This result was very unexpected, as the greater adhesion between the particles of oil might have led us to anticipate a much greater augmentation. When the cylinders oscillated both in oil and water with the same velocity, the part of the resistance R produced by the inertia of the fluid particles which the cylinder put in motion, was almost the same in both. As this part of the resistance depends on the quantity of particles put in motion, and not on their adhesion, the resistances due to the inertia of the particles will be in different fluids as their densities.

Coulomb promises to extend his researches on the resistance of fluids.

238. In a subsequent memoir Coulomb proposes to determine numerically the part of the resistance proportional to the square of the velocity, and to ascertain the resistance of globes with plain, convex, and concave surfaces. He has found in general that the resistance of bodies not entirely immersed in the fluid is much greater than that of bodies which are wholly immersed; and he promises to make farther experiments upon this point. We intended on the present occasion to have given the reader a more complete view of the researches of this ingenious philosopher; but these could not well be understood without a knowledge of his investigations respecting the force of torsion, which we have not yet had an opportunity of communicating. In the article MECHANICS, however, we shall introduce the reader to this interesting subject; and may afterwards have an opportunity of making him farther acquainted with those researches of Coulomb, of which we have at present given only a general view.

Researches of Dr Hutton.

239. The subject of the resistance of fluids has been recently treated by the learned Dr Hutton of Woolwich. His experiments were made in air, with bodies of various forms, moving with different velocities, and inclined at various angles to the direction of their motion. The following table contains the results of many interesting experiments. The numbers in the 9th column represent the exponents of the power of the velocity which the resistances in the 8th column bear to each other.

TABLE I. *Shewing the Resistance of Hemispheres, Cones, Cylinders, and Globes, in different Positions, and moving with different Velocities.*

Velocity per second.	Small hemisphere, $4\frac{3}{4}$ inches dia. flat side.	Large hemisphere $6\frac{5}{8}$ inches diameter.		Cone $6\frac{5}{8}$ inches diameter.		Cylinder $6\frac{5}{8}$ inches diameter.	Globe $6\frac{5}{8}$ inches diameter.	Power of the vel. to which the resistance is proportional.
		Flat side.	Round side.	Vertex.	Base.			
Feet.	Ounces av.	Ounces av.	Ounces av.	Ounces av.	Ounces av.	Ounces av.	Ounces av.	
3	.028	.051	.020	.028	.064	.050	.027	
4	.048	.096	.039	.048	.109	.090	.047	
5	.072	.148	.063	.071	.162	.143	.068	
6	.103	.211	.092	.098	.225	.205	.094	
7	.141	.284	.123	.129	.298	.278	.125	
8	.184	.368	.160	.168	.382	.360	.162	
9	.233	.464	.199	.211	.478	.456	.205	
10	.287	.573	.242	.260	.587	.565	.255	
11	.349	.698	.292	.315	.712	.688	.310	2.052
12	.418	.836	.347	.376	.850	.826	.370	2.042
13	.492	.988	.409	.440	1.000	.979	.435	2.036
14	.573	1.154	.478	.512	1.166	1.145	.505	2.031
15	.661	1.336	.552	.589	1.346	1.327	.581	2.031
16	.754	1.538	.634	.673	1.546	1.526	.663	2.033
17	.853	1.757	.722	.762	1.763	1.745	.752	2.038
18	.959	1.928	.818	.858	2.002	1.986	.848	2.044
19	1.073	2.998	.921	.959	2.260	2.246	.949	2.047
20	1.196	2.542	1.033	1.069	2.540	2.528	1.057	2.051
Mean proportional numbers.	140	288	119	126	291	285	124	2.040
1	2	3	4	5	6	7	8	9

From

On the Refiftance of Fluids.

Refults of the preceding experiments.

240. From the preceding experiments we may draw the following conclufions: 1. That the refiftance is nearly proportional to the furfaces, a fmall increafe taking place when the furfaces and the velocities are great. 2. The refiftance to the fame furface moving with different velocities, is nearly as the fquare of the velocity; but it appears from the 9th column that the exponent increafes with the velocity. 3. The round and fharp ends of folids fuftain a greater refiftance than the flat ends of the fame diameter. 4. The refiftance to the bafe of the hemifphere is to the refiftance on the convex fide, or the whole fphere, as $2\frac{1}{5}$ to 1, inftead of 2 to 1, as given by theory. 5. The refiftance on the bafe of the cone is to the refiftance on the vertex nearly as $2\frac{3}{10}$ to 1; and in the fame ratio is radius to the fine of half the angle at the vertex. Hence in this cafe the refiftance is directly as the fine of the angle of incidence, the tranfverfe fection being the fame. 6. The refiftance of the bafe of a hemifphere, the bafe of a cone, and the bafe of a cylinder, are all different, though thefe bafes be exactly equal and fimilar.

241. The following table contains the refiftance fuftained by a globe 1.965 inches in diameter. The fourth column is the quotient of the refiftance by experiment, divided by the theoretical refiftance.

Experiments with a globe 1.965 inches in diameter.

TABLE II. *Containing the Refiftance to a Globe* 1.965 *Inches in Diameter, moving with various Velocities, according to Theory and Experiment.*

Velocity of the Globe per fecond.	Refiftance by experiment.	Refiftance by theory.	Ratio between the experimental and theoretical refiftance.	Power of the velocity to which the refiftance is proportional.
Feet.	Oz. avoir.	Oz. avoir.		
5	0.006	0.005	1.20	
10	0.0245	0.020	1.23	
15	0.055	0.044	1.25	
20	0.100	0.079	1.27	
25	0.157	0.123	1.28	2.022
30	0.23	0.177	1.30	2.059
40	0.42	0.314	1.33	2.068
50	0.67	0.491	1.36	2.075
100	2.72	1.964	1.38	2.059
200	11	7.9	1.40	2.041
300	25	18.7	1.41	2.039
400	45	31.4	1.43	2.039
500	72	49	1.47	2.044
600	107	71	1.51	2.051
700	151	96	1.57	2.059
800	205	126	1.63	2.067
900	271	159	1.70	2.077
1000	350	196	1.78	2.086
1100	442	238	1.86	2.095
1200	546	283	1.90	2.102
1300	661	332	1.99	2.107
1400	785	385	2.04	2.111
1500	916	442	2.07	2.113
1600	1051	503	2.09	2.113
1700	1186	568	2.08	2.111
1800	1319	636	2.07	2.108
1900	1447	709	2.04	2.104
2000	1569	786	2.00	2.098
1	2	3	4	5

242. It appears from a comparifon of the 2d, 3d, and 4th columns, that when the velocity is fmall the refiftance by experiment is nearly equal to that deduced from theory; but that as the velocity increafes, the former gradually exceeds the latter till the velocity is 1300 feet per fecond, when it becomes twice as great. The difference between the two refiftances then increafes, and reaches its maximum between the velocities of 1600 and 1700 feet. It afterwards decreafes gradually as the velocity increafes, and at the velocity of 2000 the refiftance by experiment is again double of the theoretical refiftance.—By confidering the numbers in column 5th it will be feen, that in flow motions the refiftances are nearly as the fquares of the velocities; that this ratio increafes gradually, though not regularly, till at the velocity of 1500 or 1600 feet it arrives at its maximum. It then gradually diminifhes as the velocity increafes.

Conclufions fimilar to thefe were deduced from experiments made with globes of a larger fize.

243. The following table contains the refiftance of a plane inclined at various angles, according to experiment, and according to a formula deduced from the experiments.

TABLE III. *Containing the Refiftances to a Plane inclined at various Angles to the Line of its Motion.*

Inclination of the plane.	Refiftances by experiment.	Refiftances by the formula $0.84s^{1.842c}$.	Sines of the angles to radius .840.
Degrees.	Oz. avoir.	Oz. avoir.	
0	.000	000	.000
5	.015	.009	.073
10	.044	.035	.146
15	.082	.076	.217
20	.133	.131	.287
25	.200	.199	.355
30	.278	.278	.420
35	.362	.363	.482
40	.448	.450	.540
45	.534	.535	.594
50	.619	.613	.643
55	.684	.680	.688
60	.729	.736	.727
65	.770	.778	.761
70	.803	.808	.789
75	.823	.826	.811
80	.835	.836	.827
85	.839	.839	.838
90	.840	.840	.840
1	2	3	4

244. The plane with which the preceding experiments were performed was 32 fquare inches, and always moved with a velocity of 12 feet per fecond. The refiftances which this plane experienced are contained in column 2d. From the numbers in that column Dr Hutton deduced the formula $.84s^{1.842c}$, where s is the fine, and c the cofine of the angles of inclination in the firft column. The refiftances computed from this formula are contained in column 3d, and agree very nearly

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ly with the refiftances deduced from experiment. The 4th column contains the fines of the angles in the firft column to a radius .84, in order to compare them with the refiftances which have obviously no relation either to the fines of the angles or to any power of the fines. From the angle of 0 to about 60° the refiftances are lefs than the fines; but from 60° to 90° they are fomewhat greater.

Refearches of Mr Vince.

245. The experiments of Mr Vince were made with bodies at a confiderable depth below the furface of water; and he determined the refiftance which they experienced, both when they moved in the fluid at reft, and when they received the impulfe of the moving fluid. In the experiments contained in the following table, the body moved in the fluid with a velocity of 0.66 feet in a fecond. The angles at which the planes ftruck the fluid are contained in the firft column. The fecond column fhews the refiftance by experiment in the direction of their motion in troy ounces. The third column exhibits the refiftance by theory, the perpendicular diftance being fuppofed the fame as by experiment. The fourth column fhews the power of the fine of the angle to which the refiftance is proportional, and was computed in the following manner. Let s be the fine of the angle, radius being 1, and r the refiftance at that angle. Suppofe r to vary as s^m, then we have $r^m : s^m = 0.2321 : r$; hence $s^m = \frac{1}{0.2321}$, and therefore $m = \frac{\text{Log. } r - \text{Log. } 0.2321}{\text{Log. } s}$, and by fubftituting their correfponding values, inftead of r and s we fhall have the values of m or the numbers in the fourth column.

Determination of the refiftance when the body moved in the fluid.

TABLE IV. *Containing the Refiftance of a Plane Surface moving in a Fluid, and placed at different Angles to the Path of its Motion.*

Angle of inclination.	Refiftance by experiment.	Refiftance by theory.	Power of the fine of the angle to which the refiftance is proportional.
Degrees.	Troy ounces.	Troy ounces.	Exponents.
10	0.0112	0.0012	1.73
20	0.0364	0.0093	1.73
30	0.0769	0.0290	1.54
40	0.1174	0.0616	1.54
50	0.1552	0.1043	1.51
60	0.1902	0.1476	1.38
70	0.2125	0.1926	1.42
80	0.2237	0.2217	2.41
90	0.2321	0.2321	
1	2	3	4

246. According to the theory the refiftance fhould vary as the cube of the fine, whereas from an angle of 90° it decreafes in a lefs ratio, but not as any conftant power, nor as any function of the fine and cofine. Hence the actual refiftance always exceeds that which is deduced from theory, affuming the perpendicular refiftance to be the fame. The caufe of this difference is partly owing to our theory neglecting that part of the force which after refolution acts parallel to the plane, but which according to experiments is really a part of the force which acts upon the plane.

Ofcillation of Fluids, &c.

247. Mr Vince made alfo a number of experiments on the refiftance of hemifpheres, globes, and cylinders, which moved with a velocity of 0.542 feet per fecond. He found that the refiftance to the fpherical fide of a hemifphere was to the refiftance on its bafe as 0.034 is to 0.08339; that the refiftance of the flat fide of a hemifphere was to the refiftance of a cylinder of the fame diameter, and moving with the fame velocity, as 0.08339 is to 0.07998; and that the refiftance to a complete globe is to the refiftance of a cylinder of the fame diameter, and with the fame velocity, as 1 : 2.23.

Experiments with hemifpheres, globes, and cylinders.

248. The following refults were obtained, when the plane was ftruck by the moving fluid. The 2d column of the following table contains the refiftance by experiment, and the 3d column the refiftance by theory from the perpendicular force, fuppofing it to vary as the fine of the inclination.

Determination of the refiftance when the body is ftruck by the moving fluid.

TABLE V. *Containing the Refiftance of a Plane ftruck by the Fluid in Motion, and inclined at different Angles to the direction of its Path.*

Angle of inclination.	Refiftance by experiment.			Refiftance by theory.		
Degrees.	Oz.	dwts.	grs.	Oz.	dwts.	grs.
90	1	17	12	1	17	12
80	1	17	0	1	16	22
70	1	15	12	1	15	6
60	1	12	12	1	12	11
50	1	18	10	1	18	17
40	1	4	10	1	4	2
30	0	18	18	0	18	18
20	0	12	12	0	12	19
10	0	6	4	0	6	12
1	2			3		

249. It appears from the preceding refults, that the refiftance varies as the fine of the angle at which the fluid ftrikes the plane, the difference between theory and experiment being fuch as might be expected from the neceffary inaccuracy of the experiments.

By comparing the preceding table with Table IV. it will be found that the refiftance of a plane moving in a fluid is to the refiftance of the fame plane when ftruck by the fluid in motion as 5 to 6. In both thefe cafes the actual effect on the plane muft be the fame, and therefore the difference in the refiftance can arife only from the action of the fluid behind the body in the former cafe.

CHAP. IV. *On the Ofcillation of Fluids, and the Undulation of Waves.*

PROP. I.

On the ofcillation of water in a fyphon.

250. The ofcillations of water in a fyphon, confifting of two vertical branches and a horizontal one, are ifochronous, and have the fame duration

Oscillation of Fluids, &c.

tion as the oscillations of a pendulum, whose length is equal to half the length of the oscillating column of water.

Plate CCLXIX. Fig. 2.

Into the tube MNOP, having its internal diameter everywhere the same, introduce a quantity of water. When the water is in equilibrio, the two surfaces AB, CD will be in the same horizontal line AD. If this equilibrium be disturbed by making the syphon oscillate round the point y, the water will rise and fall alternately in the vertical branches after the syphon is at rest. Suppose the water to rise to EF in the branch MO, it will evidently fall to GH in the other branch, so that CG is equal to AE. Then it is evident, that the force which makes the water oscillate, is the weight of the column EFKL, which is double the column EABF; and that this force is to the whole weight of the water, as 2 AE is to AOPD.

Fig. 3.

Now, let P be a pendulum, whose length is equal to half the length of the oscillating column AOPD, and which describes to the lowest point S arches PS, equal to AE; then 2 AE : AOPD = AE : QP, because AE is one-half of 2 AE, and QP one-half of AOPD. Consequently, since AOPD is a constant quantity, the force which makes the water oscillate is always proportional to the space which it runs through, and its oscillations are therefore isochronous. The force which makes the pendulum describe the arch PS, is to the weight of the pendulum as PS is to PQ, or as AE is to PQ, since AE = PS; but the force which makes the water oscillate, is to the weight of the whole water in the same ratio; consequently, since the pendulum P, and the column AOPD, are influenced by the very same force, their oscillations must be performed in the same time. Q. E. D.

251. Cor. As the oscillations of water and of pendulums are regulated by the same laws, if the oscillating column of water is increased or diminished, the time in which the oscillations are performed will increase or diminish in the subduplicate ratio of the length of the pendulum.

Scholium.

252. This subject has been treated in a general manner, by Newton and different philosophers, who have shewn how to determine the time of an oscillation, whatever be the form of the syphon. See the *Principia*, lib. ii. Prop. 45, 46. Bossut's *Traité d'Hydrodynamique*, tom. i. *Notes sur le Chap. II. Part II. Bernouilli Opera*, tom. iii. p. 125. and *Encyclopedié*, art. *Ondes*.

Prop. II.

On the undulation of waves.

253. The undulations of waves are performed in the same time as the oscillations of a pendulum whose length is equal to the breadth of a wave, or to the distance between two neighbouring cavities or eminences.

Fig. 4.

In the waves ABCDEF, the undulations are performed in such a manner, that the highest parts A, C, E become the lowest; and as the force which depresses the eminences A, C, E, is always the weight of water contained in these eminences, it is obvious, that the undulations of waves are of the same kind as the undulations or oscillations of water in a syphon. It follows, therefore, from Prop. I. that if we take a pendulum, whose length is one-half BM, or half the distance between the highest and lowest parts of the wave, the highest parts of each wave will descend to the lowest parts during one oscillation of the pendulum, and in the time of another oscillation will again become the highest parts. The pendulum, therefore, will perform two oscillations in the time that each wave performs one undulation, that is, in the time that each wave describes the space AC or BD, between two neighbouring eminences or cavities, which is called *the breadth of the wave*. Now if a pendulum, whose length is one-half BM, performs two oscillations in the above time, it will require a pendulum four times that length to perform only one oscillation in the same time, that is, a pendulum whose length is AC or BD, since $4 \times \frac{1}{2}$BM = 2 BM = AC or BD. Q. E. D.

Scholium.

254. The explanation of the oscillation of waves contained in the two preceding propositions, was first given by Sir Isaac Newton, in his *Principia*, lib. ii. Prop. 44. He considered it only as an approximation to the truth, since it supposes the waves to rise and fall perpendicularly like the water in the vertical branches of the syphon, while their real motion is partly circular. The theory of Newton was, nevertheless, adopted by succeeding philosophers, and gave rise to many analogous discussions respecting the undulation of waves. Very lately, however, an attempt has been made by M. Flaugergues, to overturn the theory of Newton. From a number of experiments on the motion and figure of waves, an account of which may be seen in the *Journal des Sçavans*, for October 1789, M. Flaugergues concludes, that a wave is not the result of a motion in the particles of water, by which they ascend and descend alternately in a serpentine line, when moving from the place where the water received the shock; but that it is an intumescence which this shock occasions around the place where it is received, by the depression that is there produced. This intumescence afterwards propagates itself circularly, while it removes from the place where the shock first raised it above the level of the stagnant water. A portion of the stagnant water then flows from all sides into the hollow formed at the place where the shock was received; this hollow is thus heaped with fluid, and the water is elevated so as to produce all around another intumescence, or a new wave, which propagates itself circularly as before. The repetition of this effect produces on the surface of the water a number of concentric rings, successively elevated and depressed, which have the appearance of an undulatory motion. This interesting subject has also been discussed by M. La Grange, in his *Mechanique Analytique*, to which we must refer the reader for farther information. See also some excellent remarks on this subject, in Mr Leslie's Essay on Heat, p. 225. and note 29.

New theory of the formation of waves by M. Flaugergues.

PART

PART III. ON HYDRAULIC MACHINERY.

Hydraulic machines.

255. TO defcribe the various machines in which water is the impelling power, would be an endlefs and unprofitable tafk. Thofe machines which can be driven by wind, fteam, and the force of men or horfes, as well as they can be driven by water, do not properly belong to the fcience of hydraulics. By hydraulic machinery, therefore, we are to underftand thofe various contrivances by which water can be employed as the impelling power of machinery; and thofe machines which are employed to raife water, or which could not operate without the affiftance of that fluid.

CHAP. I. *On Water-Wheels.*

Different kinds of water-wheels.

256. WATER-wheels are divided into three kinds, overfhot-wheels, breaft-wheels, and underfhot-wheels, which derive their names from the manner in which the water is delivered upon their circumferences.

SECT. I. *On Overfhot-Wheels.*

Defcription of an overfhot-wheel. Plate CCLXIX. Fig. 5.

257. An overfhot-wheel is a wheel driven by the weight of water, conveyed into buckets difpofed on its circumference. It is reprefented in fig. 5. where ABC is the circumference of the wheel furnifhed with a number of buckets. The canal MN conveys the water into the fecond bucket from the top A *a*. The equilibrium of the wheel is therefore deftroyed; and the power of the bucket A *a*, to turn the wheel round its centre of motion O, is the fame as if the weight of the water in the bucket were fufpended at *m*, the extremity of the lever O *m*, *c* being the centre of gravity of the bucket, and O *m* a perpendicular let fall from the fulcrum O to the direction *c m*, in which the force is exerted. In confequence of this deftruction of equilibrium, the wheel will move round in the direction AB, the bucket A *a* will be at *d*, and the empty bucket *b* will take the place of A *a*, and receive water from the fpout N. The force acting on the wheel is now the water in the bucket *d* acting with a lever *n* O, and the water in the bucket A *a* acting with a lever *m* O. The velocity of the wheel will therefore increafe with the number of loaded buckets, and with their diftance from the vertex of the wheel; for the lever by which they tend to turn the wheel about its axis, increafes as the buckets approach to *c*, where their power, reprefented by *e* O, is a maximum. After the buckets have paffed *e*, the lever by which they act gradually diminifhes, they lofe by degrees a fmall portion of their water; and as foon as they reach B it is completely difcharged. When the wheel begins to move, its velocity will increafe rapidly till the quadrant of buckets *b e* is completely filled. While thefe buckets are defcending through the inferior quadrant *e* P, and the buckets on the left hand of *b* are receiving water from the fpout, the velocity of the wheel will ftill increafe; but the increments of velocity will be fmaller and fmaller, fince the levers by which the inferior buckets act are gradually diminifhing. As foon as the higheft bucket A *c* has reached the point B where it is emptied, the whole femicircumference nearly of the wheel is loaded with water; and when the bucket at B is difcharging its contents, the bucket at A is filling, fo that the load in the buckets, by which the wheel is impelled, will be always the fame, and the velocity of the wheel will become uniform.

Method of computing the momentum of the water in the loaded arch.

258. In order to find the power of the loaded arch to turn the wheel, or, which is the fame thing, to find a weight which fufpended at the oppofite extremity C, will balance the loaded arch or keep it in equilibrio, we muft multiply the weight of water in each bucket by the length of the virtual lever by which it acts, and take the fum of all thefe momenta for the momentum of the loaded arch. It will be much eafier, however, and the refult will be the fame, if we multiply the weight of all the water on the arch AB, by the diftance of its centre of gravity G, from the fulcrum or centre of motion O. Now, by the property of the centre of gravity (See MECHANICS), the diftance of the centre of gravity of a circular arch from its centre, is a fourth proportional to half the arch, the radius, and the fine of half the arch. Since the vertical bucket *b* has no power to turn the wheel if it were filled, and fince two or three buckets between B and P are always empty, we may fafely fuppofe that the loaded arch never exceeds $160°$, fo that if $R =$ radius of the wheel in feet, we fhall have the length of half the loaded arch, or $80° = 2R \times 3.1416 \times \frac{80}{360} = R \times 1.396$; and the diftance of the centre of gravity from the fulcrum O, $= GO = \frac{R \times \text{Sin. } 80°}{R \times 1.396}$. Now, if N be the number of buckets in the wheel, $\frac{160\,N}{360}$, or $\frac{4\,N}{9}$ will be the number of buckets in the loaded arch; and if G be the number of ale gallons contained in each bucket, the weight of the water in each bucket will be $10.2 \times G$ pounds avoirdupois. The weight of the water, therefore, in the loaded arch, will be $\frac{4\,N}{9} \times 10.2\,G$, and confequently the momentum of the loaded arch will be $= \frac{4\,N}{9} \times 10.2\,G \times \frac{R \times \text{Sin. } 80°}{R \times 1.396} = \frac{4\,N}{9} \times 10.2\,G \times 0.6338 = \frac{4\,N}{9} \times 6.465\,G$ pounds avoirdupois. Hence, we have the following rule: Multiply the conftant number 6.465 by $\frac{4}{9}$ of the number of buckets in the wheel, and this product by the number of ale gallons in each bucket; and the refult will be the effective weight, or momentum of the water in the loaded arch. For a defcription of the beft form that can be given to the buckets, fee the article *WATER-Works*. Dr Robifon has there recommended a mode of conftructing the buckets invented by Mr Burns, who divided each bucket into two by means of a partition; but the writer of this article is affured, on the authority of an ingenious millwright, who wrought with Mr Burns at the time when wheels of this kind were conftructed, that the inner bucket is never filled with water, and that much of the power is thus loft. The partition prevents the introduction

On Water-Wheels.

introduction of the fluid, and the water is driven backwards by the escape of the included air.

On the diameter of overshot-wheels relatively to the height of the fall.

259. In the construction of overshot-wheels, it is of great importance to determine what should be the diameter of the wheel relatively to the height of the fall. It is evident that its diameter cannot exceed the height of the fall. Some mechanical writers have demonstrated that, in theory, an overshot-wheel will produce a maximum effect when its diameter is two-thirds of that height, the water being supposed to fall into the buckets with the velocity of the wheel. But this rule is palpably erroneous, and directly repugnant to the results of experiment. For if the height of the fall be 48 feet, the diameter of the wheel will, according to this rule, be 32 feet; and the water having to fall through 16 feet before it reaches the buckets, will have a velocity of 32 feet per second, which, according to the hypothesis, must also be the velocity of the wheel's circumference. But Smeaton has proved, that a maximum effect is produced by an overshot-wheel of any diameter, when its velocity is only *three* feet per second. The chevalier de Borda has shewn, that overshot-wheels will produce a maximum effect when their diameter is equal to the height of the fall; and this is completely confirmed by Mr Smeaton's experiments. From a great number of trials, Mr Smeaton has concluded, "that the higher the wheel is in proportion to the whole descent, the greater will be the effect." Nor is it difficult to assign the reason of this. The water which is conveyed into the buckets can produce very little effect by its impulse, even if its velocity be great; both on account of the obliquity with which it strikes the buckets, and in consequence of the loss of water occasioned by a considerable quantity of the fluid being dashed over their sides. Instead, therefore, of expecting an increase of effect from the impulse of the water occasioned by its fall through one-third of the whole height, we should allow it to act through this height by its gravity, and therefore make the diameter of the wheel as great as possible. But a disadvantage attends even this rule; for if the water is conveyed into the buckets without any velocity, which must be the case when the diameter of the wheel equals the height of the fall, the velocity of the wheel will be retarded by the impulse of the buckets against the water, and much power would be lost by the water dashing over them. In order, therefore, to avoid all inconveniences, the distance of the spout from the receiving bucket should, in general, be about two or three inches, that the water may be delivered with a velocity a little greater than that of the wheel; or, in other words, the diameter of an overshot-wheel should be two or three inches less than the greatest height of the fall; and yet it is no uncommon thing to see the diameters of these wheels scarcely one-half of that height. In such a construction the loss of power is prodigious.

On the proper velocity of overshot-wheels. Experiments of Deparcieux on the velocity of overshot-wheels.

260. The proper velocity of overshot wheels is a subject on which mechanical writers have entertained different sentiments. While some have maintained that there is a certain velocity which produces a maximum effect, Deparcieux has endeavoured to prove by a set of ingenious experiments that most work is performed by an overshot wheel when it moves slowly, and that the more its motion is retarded by increasing the work to be performed, the greater will be the performance of the wheel. In these experiments he employed a small wheel, 20 inches in diameter, having its circumference furnished with 48 buckets. On the centre or axle of this wheel were placed 4 cylinders of different diameters, the first being 1 inch in diameter, the second 2 inches, the third 3 inches, and the fourth 4 inches. When the experiments are made, a cord is attached to one of the cylinders, and after passing over a pulley a weight is suspended at its other extremity. By moving the wheel upon its axis, the cord winds round the cylinder and raises the weight. In order to diminish the friction, the gudgeons of the wheel are supported by two friction rollers, and before the wheel, a little higher than its axis, is placed a small table which supports a vessel filled with water, having an orifice in the side next the wheel. Above this vessel is placed a large bottle full of water and inverted, having its mouth immersed a few lines in the water, so that it empties itself in proportion as the water in the vessel is discharged from the orifice. The quantity of water thus discharged is always the same, and is conveyed from the orifice by means of a canal to the buckets of the wheel. With this apparatus he obtained the following results.

Diameters of the Cylinders.	Altitude through which 12 ounces were elevated.		Altitude through which 24 ounces were elevated.	
Inches.	Inches.	Lines.	Inches.	Lines.
1	69	9	40	0
2	80	6	43	6
3	85	6	44	6
4	87	9	45	3

Results of the preceding experiments.

261. When the large cylinders were used, the velocity of the wheel was smaller, because the resistances are proportional to their diameter, the weight being the same. Hence, it appears, by comparing the four results in column 2d with one another, and also the four results in column 3d, that when the wheel turns more slowly, the effect, which is in this case measured by the elevation of the weight, always increases. When the weight of 24 ounces was used, the resistance was twice as great, and the velocity twice as slow, as when the 12 ounce weight was employed. But by comparing the results in column 2d with the corresponding results in column 3d, it appears, that when the 24 ounce weight was employed, and the velocity was only one-half of what it was when the 12 ounce weight was used, the effect was *more than one-half*, the numbers in the 3d column being more than one-half the numbers in the 2d. Hence we may conclude, that the slower an overshot wheel moves, the greater will be its performance.

An overshot-wheel does more work the slower it moves.

The chevalier d'Arcy maintains, that there is a velocity which gives a maximum effect.

262. These experiments of Deparcieux presented such unexpected results, as to induce other philosophers to examine them with care. The chevalier d'Arcy, in particular, considered them attentively. He maintained that there was a determinate velocity when the effect of the wheel reached its maximum; and he has shewn, by comparing the experiments of Deparcieux with his own formulæ, that the overshot wheel which Deparcieux employed never moved with such a small velocity as corresponded with the maximum effect, and that

if

if he had increafed the diameter of his cylinders, or the magnitude of the weights, his own experiments would have exhibited the degree of velocity, when the effect was the greateft poffible.

His opinion confirmed by the experiments of Smeaton.

263. The reafoning of the chevalier d'Arcy is completely confirmed by the experiments of Smeaton. This celebrated engineer concludes with Deparcieux that, *cæteris paribus*, the lefs the velocity of the wheel, the greater will be its effect. But he obferves, on the contrary, that when the wheel of his model made about 30 turns in a minute, the effect was nearly the greateft; when it made 30 turns, the effect was diminifhed about one-twentieth part; and that when it made 40 it was diminifhed about one-fourth; when it made lefs than 18¼ turns, its motion was irregular, and when it was loaded fo that it could not make 18 turns, the wheel was overpowered by its load. Mr Smeaton likewife obferves, that when the circumferences of overfhot wheels, whether high or low, move with the velocity of three feet per fecond, and when the other parts of the work are properly adapted to it, they will produce the greateft poffible effect. He allows, however, that high wheels may deviate farther from this rule before lofing their power than low ones can be permitted to do; and affures us that he has feen a wheel 24 feet high moving at the rate of fix feet per fecond, without lofing any confiderable part of its power, and likewife a wheel 33 feet high moving very fteadily and well with a velocity but little exceeding two feet.

And alfo by the experiments of Boffut.

264. The experiments of the abbé Boffut may alfo be brought forward in fupport of the fame reafoning. He employed a wheel 3 feet in diameter, furnifhed with 48 buckets, having each three inches of depth, and four inches of width. The canal which conveyed the water into the buckets was perfectly horizontal, and was five inches wide. It furnifhed uniformly 1194 cubic inches of water in a minute. The refiftance to be overcome was a variety of weights fixed to the extremity of a cord, which, after paffing over a pulley as in Deparcieux's experiments, winded round the cylindrical axle of the wheel. The diameter of this cylinder was two inches and feven lines, and that of the gudgeons or pivots of the wheel two lines and a half. The number of turns which the wheel made in a minute was not reckoned till its motion became uniform, which always happened when it had performed five or fix revolutions. When the wheel was unloaded it made 40¼ turns in a minute.

Number of pounds raifed.	Number of feconds in which the load was raifed.	Number of revolutions performed by the wheel.	Effect of the wheel, or the product of the number of turns multiplied by the load.
11	60″	$11\frac{46}{48}$	$131\frac{32}{48}$
12	60	$11\frac{11}{48}$	$134\frac{36}{48}$
13	60	$10\frac{25}{48}$	$136\frac{37}{48}$
14	60	$9\frac{40}{48}$	$137\frac{32}{48}$
15	60	$9\frac{10}{48}$	$138\frac{6}{48}$
16	60	$8\frac{31}{48}$	$138\frac{16}{48}$
17	60	$8\frac{9}{48}$	$139\frac{9}{48}$
18	60	$7\frac{32}{48}$	138
19	The wheel turned but exceedingly flow.		
20	The wheel ftopped tho' firft put in motion by the hand to make it catch the water.		

265. It appears evidently from the laft column, which we have computed on purpofe, that the effect increafes as the velocity diminifhes; but that the effect is a maximum when the number of turns is $8\frac{9}{48}$ in a minute, being then $139\frac{9}{48}$. When the velocity was farther diminifhed by adding an additional pound to the refiftance, the effect was diminifhed to 138, and when the velocity was ftill lefs, the wheel ceafed to move.

Now fince the wheel was three feet in diameter, and 9.42 feet in circumference, the velocity of its circumference will be about one foot four inches per fecond, when it performs $8\frac{9}{48}$ turns in a minute, or when the maximum effect is produced. With Mr Smeaton's model, the maximum effect was produced when the velocity of the wheel's circumference was two feet per fecond. So that the experiments both of Smeaton and Boffut concur to prove, that the power of overfhot wheels increafes as the velocity diminifhes; but that there is a certain velocity, between one and two feet per fecond, when the wheel produces a maximum effect. Since when the wheel was unloaded it turned 40¼ times in a minute, and performed only $8\frac{9}{48}$ revolutions when its power was a maximum, the velocity of the wheel when unloaded will be to its velocity when the effect is the greateft, as five to one, nearly.

On the effect of overfhot-wheels.

266. The chevalier de Borda maintains that an overfhot wheel will raife through the height of the fall a quantity of water equal to that by which it is driven, and Albert Euler has fhewn that the effect of thefe wheels is very much inferior to the momentum or force which impels them. It appears, however, from Mr Smeaton's experiments, that when the work performed was a maximum, the ratio of the power to the effect was as four to three, when the height of the

fall

On Water-Wheels.

fall and the quantities of water expended were the leaſt; but that it was as four to two when the heights of the fall and the quantities diſcharged were the greateſt. By taking a mean between theſe ratios, we may conclude, in general, that in overſhot wheels the power is to the effect as three to one. In this caſe the power is ſuppoſed to be computed from the whole height of the fall; becauſe the water muſt be raiſed to that height in order to be in a condition of producing the ſame effect a ſecond time. When the power of the water is eſtimated only from the height of the wheel, the ratio of the power to the effect was more conſtant, being nearly as five to four.

Inveſtigations of Albert Euler.

267. The theory of overſhot wheels has been ably diſcuſſed by Albert Euler, and Lambert. The former of theſe philoſophers has ſhown that the altitude of the wheel ſhould be made as great as poſſible; that the buckets ſhould be made as capacious as other circumſtances will permit; that their form ſhould be ſuch as to convey the water as near the loweſt point of the wheel as can be conveniently done; and that the motion of the wheel ſhould be ſlow, that the buckets may be completely filled. He has likewiſe ſhown that the effect of the wheel increaſes as its velocity is diminiſhed; and that overſhot wheels ſhould be uſed only when there is a ſufficient height of fall. The reſults of Lambert's inveſtigations are leſs conſonant with the experiments of Smeaton. By examining the following table, which contains theſe reſults, it will appear at once that he makes the diameter of the wheel much ſmaller than it ought to be.

Reſults of Lambert's reſearches.

TABLE *for Overſhot Mills.*

Height of the fall, reckoning from the ſurface of the ſtream.	Radius of the wheel reckoning from the extremity of the buckets.	Width of the buckets.	Depth of the buckets.	Velocity of the wheel per ſecond.	Time in which the wheel performs one revolution.	Turns of the millſtone for one of the wheel.	Force of the water upon the buckets.	The length of *m*, *n*, in Fig. 6. Plate CCLXIX.	The length of *n*, *o*, in Fig. 6. Plate. CCLXIX.	Quantity of water required per ſecond to turn the wheel.
Feet.	Feet.	Feet.	Feet.	Feet.	Seconds.		lbs. Avoir.	Feet.	Feet.	Cub. Feet.
7	2.83	1.00	2.02	5.27	3.38	8.45	636	0.33	1.15	10.55
8	3.22	1.14	1.44	5.63	3.61	9.02	595	0.38	1.32	9.23
9	3.63	1.27	1.07	5.94	3.83	9.57	565	0.42	1.48	8.21
10	4.04	0.43	0.82	6.30	4.04	10.10	531	0.48	1.65	7.38
11	4.45	0.57	0.65	6.60	4.23	10.57	511	0.52	1.81	6.71
12	4.86	0.71	0.52	6.89	4.42	11.05	486	0.57	1.98	6.15
1	2	3	4	5	6	7	8	9	10	11

SECT. II. *On Breaſt Wheels.*

Deſcription of breaſt-wheels. Plate CCLXIX. Fig. 6.

268. A breaſt wheel partakes of the nature both of an overſhot and an underſhot wheel, and is driven partly by the impulſe, but chiefly by the weight of the water. A water wheel of this kind is repreſented in fig. 6. where MC is the ſtream of water falling on the floatboard *o*, with a velocity correſponding to the altitude *m n*, and afterwards acting by its weight on the floatboards between *o* and B. The mill courſe *o* B is made concentric with the wheel, which is fitted to it in ſuch a manner that very little water is allowed to eſcape at the ſides and extremities of the floatboards. According to Mr Smeaton, the effect of a wheel driven in this manner is equal "to the effect of an underſhot wheel whoſe head of water is equal to the difference of level between the ſurface of water in the reſervoir, and the point where it ſtrikes the wheel, added to that of an overſhot whoſe height is equal to the difference of level between the point where it ſtrikes the wheel and the level of the tail water (M)." That is, the effect of the wheel A is equal to that of an underſhot wheel driven by a fall of water equal to *m n*, added to that of an overſhot wheel whoſe height is equal to *n* D.

Reſults of the inveſtigations of Lambert.

269. Mr Lambert of the academy of ſciences at Berlin (N) has ſhewn that when the floatboards arrive at the poſition *o p*, they ought to be horizontal: the point *p* ſhould be lower than *o*, in order that the whole ſpace between any two adjacent floatboards may be filled with water; and that C *m* ſhould be equal to the depth of the floatboards. He obſerves alſo that a breaſt wheel ſhould be uſed when the fall of water is above four feet in height, and below ten. The following table is calculated from Lambert's formulæ, and exhibits at one view the reſults of his inveſtigations.

TABLE

(M) Smeaton on Mills, ſchol. p. 36.

(N) *Nouv. Mem. de l'Academie de Berlin*, 1775, p. 71.

TABLE *for Breaſt Mills.*

Height of the fall in feet=CD, fig. 6. Plate CCLXIX.	Breadth of the float-boards.	Depth of the float-boards.	Radius of the water wheel reckoned from the extremity of the float-boards.	Velocity of the wheel per ſecond.	Time in which the wheel performs one revolution.	Turns of the mill-ſtone for one of the wheel.	Force of the water upon the float-boards.	The length of *m*, *n*, in Fig. 6. Plate CCLXIX.	The length of *n*, *o*, in Fig. 6. Plate CCLXIX.	Water required per ſecond to turn the wheel.
	Feet.	Feet.	Feet.	Feet.	Seconds.		lbs. Avoir.	Feet.	Feet.	Cub. Feet.
1	0.17	198.6	0.75	2.18	1.92	4.80	1536	0.08	0.23	74.30
2	0.34	35.1	1.50	3.09	2.72	6.80	1084	0.15	0.46	37.15
3	0.51	12.7	2.26	3.78	3.33	8.32	886	0.23	0.68	24.77
4	0.69	6.2	3.01	4.36	3.84	9.60	768	0.30	0.91	18.57
5	0.86	3.57	3.76	4.88	4.28	10.70	686	0.38	1.14	14.86
6	1.03	2.25	4.51	5.35	4.70	11.76	626	0.46	1.37	12.38
7	1.20	1.53	5.26	5.77	5.08	12.70	581	0.53	1.60	10.61
8	1.37	1.10	6.02	6.17	5.43	13.58	543	0.60	1.83	9.29
9	1.54	0.81	6.77	6.55	5.76	14.40	512	0.68	2.05	8.26
10	1.71	0.77	7.52	6.90	6.07	15.18	486	0.76	2.28	7.43
1	2	3	4	5	6	7	8	9	10	11

270. It appears from the preceding table, that when the altitude of the fall of water is below three feet, there is ſuch an unſuitable proportion between the depth and width of the floatboards, that a breaſt wheel cannot well be employed. It is alſo evident, on the other hand, that when the height of the fall approaches to ten feet, the depth of the floatboards is too ſmall in relation to their width. Theſe two extremes, therefore, ought to be avoided in practice. The eleventh column of the table contains the quantity of water neceſſary to drive the wheel; but the total quantity of water ſhould always exceed this, by the quantity, at leaſt, that eſcapes between the mill courſe and the ſides and extremities of the floatboards (o).

Dimenſions of a breaſt wheel. Plate CCLXIX.

271. The following are the dimenſions of an excellent breaſt water wheel, differing very little from that which is repreſented in fig. 6. The water, however, inſtead of falling through the height *c n* which is 16 inches, is delivered on the floatboard *o p*, through an adjutage ſix inches and a half high.—The height *n* D is four feet two inches; and therefore the whole height CD muſt be five feet and a half. The radius of the wheel AB is ſix feet and a half, the breadth of each floatboard ſix inches and a half, and their depth 28 inches. The point P of the wheel moves with the velocity of 7.588 feet in a ſecond. The quantity of water diſcharged in a ſecond is 3.266 cubic feet, and the force of impulſion upon the floatboards 356 pounds avoirdupois. On ſome occaſions buckets have been uſed in breaſt wheels inſtead of floatboards; but this is evidently a diſadvantage, as the height through which the water acts is diminiſhed by the number of inches through which the water muſt fall in order to acquire the velocity of the wheel, and alſo by the verſed ſine of the arch above the loweſt point of the wheel which may be conſidered as not loaded with water.

SECT. III. *On Underſhot Wheels.*

Deſcription of an underſhot wheel. Plate CCLXX. Fig. 1.

272. AN underſhot wheel is a wheel with a number of floatboards diſpoſed on its circumference, which receive the impulſe of the water conveyed to the loweſt point of the wheel by an inclined canal. It is repreſented in fig. 1. where WW is the water wheel, and ABDFHKMV the canal or mill courſe, which conveys the water to K, where it ſtrikes the plane floatboards *n o*, &c. and makes the wheel revolve about its axis.

Conſtruction of the mill courſe.

273. In order to conſtruct the mill courſe to the greateſt advantage, we muſt give but a very ſmall declivity to the canal which conducts the water from the river. It will be ſufficient to make AB ſlope about one inch in 200 yards, making the declivity, however, about half an inch for the firſt 48 yards, in order that the water may have ſufficient velocity to prevent it from falling back into the river. The inclination of the fall, repreſented by the angle GCR, ſhould be $25^\circ\ 50'$, or CR the radius ſhould be to GR, the tangent of this angle, as 100 to 28, or as 25 to 12; and ſince the ſurface of the water S*b* is bent from *a b* into *a c* before it is precipitated down the fall, it will be neceſſary to incurvate the upper part BCD of the courſe into BD, that the water at the bottom may move parallel to the water at the ſurface of the ſtream. For this purpoſe take the points B,D about 12 inches diſtant from C, and raiſe the perpendiculars BE, DE. The point of interſection E will be the centre from which the arch BD is to be deſcribed; the radius being about $10\frac{1}{10}$ inches. Now, in order that the water may act more advantageouſly upon the floatboards of the wheel WW, it muſt aſſume a horizontal direction, with the ſame velocity which it would have acquired when it came to the point G. But, if the water were allowed to fall from C to G, it would daſh upon the horizontal part HG, and thus

(o) See Appendix to Ferguſon's Lectures, vol. ii. p. 189. edit. 2d.

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thus lose a great part of its velocity. It will be necessary, therefore, to make it move along FH, an arch of a circle to which DF and KH are tangents in the points F and H. For this purpose make GF and GH each equal to three feet; and raise the perpendiculars HI, FI which will intersect one another in the point I, distant about four feet nine inches from the points F and H, and the centre of the arch FH will be determined. The distance HK, through which the water runs before it acts upon the wheel, should not be less than two or three feet, in order that the different filaments of the fluid may have attained a horizontal direction. If HK were too large, the stream would suffer a diminution of velocity by its friction on the bottom of the course. That no water may escape between the bottom of the course KH and the extremities of the floatboards, KL should be about three inches, and the extremity *o* of the floatboard *no* ought to reach below the line HKX, sufficient room being left between *o* and M for the play of the wheel; or KLM may be formed into the arch of a circle KM concentric with the wheel. The line LMV, which has been called the course of impulsion, should be prolonged so as to support the water as long as it can act upon the floatboards, and should be about nine inches distant from OP, a horizontal line passing through O the lowest point of the fall; for if OL were much less than nine inches, the water having spent the greatest part of its force in impelling the floatboard, would accumulate below the wheel, and retard its motion. For the same reason another course, which has been called the course of discharge, should be connected with LMV by the curve VN to preserve the remaining velocity of the water, which would otherwise be discharged by falling perpendicularly from V to N. The course of discharge, which is represented by the line VZ, sloping from the point O, should be about 16 yards long, having an inch of declivity for every two yards. The canal which reconducts the water from the course of discharge to the river should slope about four inches in the first 200 yards, three inches in the second 200 yards, decreasing gradually till it terminates in the river. But if the river to which the water is conveyed should, when swelled by the rains, force the water back upon the wheel, the canal must have a greater declivity to prevent this from taking place. Hence it is evident that very accurate levelling is requisite to the proper formation of the mill course.

Plate CCLXX. Fig. 2.

As it is of great importance that none of the water should escape either below the floatboards, or at their sides, without contributing to turn the wheel, the course of impulsion KV should be wider than the course at K, as represented in fig. 2. where CD the course of impulsion corresponds with LV in fig. 1. AB corresponds with HK and BC with KL. The breadth of the floatboards therefore should be wider than *mn*, and their extremities should reach a little below B, like *no* in fig. 1. When these precautions are properly taken, no water can escape without exerting its force upon the floatboards.

On the number of floatboards in undershot wheels. Fig. 3.

273. It has been disputed among philosophers, whether the wheel should be furnished with a small or a great number of floatboards. M. Pitot has shewn, that when the floatboards have different degrees of obliquity, the force of impulsion upon the different surfaces will be reciprocally as their breadths: Thus in fig. 3. the force of impulsion upon *he* will be to the force upon DO, as DO to *he* (P). Hence he concludes that the distance between the floatboards should be equal to one-half of the immersed arch, or that when one floatboard is at the bottom of the wheel, and perpendicular to the current, as DE, the preceding floatboard BC should be just leaving the stream, and the succeeding one FG just immerging into it. For when the three floatboards FG, DE, BC have the same position as in the figure, the whole force of the current NM will act upon DE when it is in the most advantageous position for receiving it, whereas, if another floatboard *de* were inserted between FG and DE, the part *ig* would cover DO, and by thus substituting an oblique for a perpendicular surface, the effect would be diminished in the proportion of DO to *ig*. Hence it is evident that, upon this principle, the depth of the floatboard DE should be always equal to the versed sine of the arch EG (Q).

Rule given by Pitot, proved to be inaccurate. Fig. 3.

274. Notwithstanding the plausibility of this reasoning, it will not be difficult to shew that it is destitute of foundation. It is evident from fig. 3. that when one of the floatboards DE is perpendicular to the stream, it receives the whole impulse of the water in the most advantageous manner. But when it arrives at the position *de*, and the succeeding one FG at the position *fg*, so that the angle *e*A*g* may be bisected by the perpendicular AE; the situation of these floatboards will be the most disadvantageous, for a great part of the water will escape between the extremities *g* and *e* of the floatboards without striking them, and the part *ig* of the floatboard, which is really impelled, is less than DE, and oblique to the current. The wheel, therefore, must move irregularly, sometimes quick and sometimes slow, according to the position of the floatboards with respect to the stream; and this inequality will increase with the arch plunged in the water. The reasoning of M. Pitot, indeed, is founded on the supposition, that if another floatboard *fg* were placed between FG and DF, it would annihilate the force of the water that impels it, and prevent any of the fluid from striking the corresponding part DO of the preceding floatboard. But this is not the case. For when the water has acted upon *fg*, it still retains a part of its motion, and after bending round the extremity *g* strikes DE with its remaining force. We are entitled, therefore, to conclude that advantage must be gained by using more floatboards than are recommended by Pitot.

The number of the floatboards should be as great as possible.

275. It is evident from the preceding remarks, that in order to remove any inequality of motion in the wheel, and prevent the water from escaping below the extremities of the floatboards, the wheel should be furnished with the greatest possible number of floatboards, without loading it too much, or enfeebling the rim on which they are

(P) *Mem. de l'Acad. Paris*, 1729, 8vo. p. 359.

(Q) A table containing the number of floatboards for wheels of different diameters, and founded on this principle, has been computed by Mr Brewster. See *Appendix to Ferguson's Lectures*, vol. ii. p. 149. 2d Edit.

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are fixed. This rule was firſt given by M. Dupetit Vandin (R); and it is eaſily perceived, that if the mill-wright ſhould err in uſing too many floatboards, this error in exceſs will be perfectly trifling, and that a much greater loſs of power would be occaſioned by an error in defect.

Form of the floatboards. Fig. 3.

276. The ſection of the floatboards ought not to be rectangular like *a b n c* in fig. 3. but ſhould be bevelled like *a b m c*. For if they were rectangular, the extremity *b n* would interrupt a portion of the water which would otherwiſe fall on the correſponding part of the preceding floatboard. In order to find the angle *a b m*, ſubtract from 180 degrees the number of degrees contained in the immerſed arch CEG, and the half of the remainder will be the angle required.

Poſition of the floatboards.

277. It has been maintained by M. Pitot and other philoſophers, that the floatboards ſhould be a continuation of the radius, or perpendicular to the rim, as in fig. 1. This indeed is true in theory, but it appears from the moſt unqueſtionable experiments, that they ſhould be inclined to the radius. This important fact was diſcovered by Deparcieux in 1753, and proved by ſeveral experiments. When the floatboards are inclined, the water heaps up on their ſurface, and acts not only by its impulſe but alſo by its weight. The ſame truth has alſo been confirmed by the abbé Boſſut, the moſt accurate of whoſe experiments are contained in the following table. The wheel that was employed was immerſed four inches vertically in the water, and it was furniſhed with 12 floatboards.

Inclination of the floatboard.	Number of pounds raiſed.	Time in which the load was raiſed in ſeconds	Number of turns made by the wheel.
0	40	40	$13\frac{17}{48}$
15	40	40	$14\frac{21}{48}$
30	40	40	$14\frac{22}{48}$
37	40	40	$14\frac{15}{48}$
1	2	3	4

278. It is obvious, from the preceding table, that the wheel made the greateſt number of turns, or moved with the greateſt velocity, when the number of floatboards was between 15 and 30. When the water-wheels are placed on canals that have little declivity, and in which the water can eſcape freely after its impulſe upon the floatboards, it would be proper to make the floatboards a continuation of the radius. But when they move in an inclined mill-courſe, an augmentation of velocity may be expected from an inclination of the floatboards.

On the proper velocity of undershot wheels when the effect is a maximum.

279. Having thus pointed out the moſt ſcientific method of conſtructing the wheel, and delivering the water upon its floatboards, we have now to determine the velocity with which it ſhould move. It is evident, that the velocity of the wheel muſt be always leſs than that of the water which impels it, even when there is no work to be performed; for a part of the impelling power is neceſſarily ſpent in overcoming the inertia of the wheel and the reſiſtance of friction. It is likewiſe obvious, that when the wheel has little or no velocity, its performance will be very trifling. There is, conſequently, a certain proportion between the velocity of the water and the wheel, when its effect is a maximum. By the reaſoning which is employed in the ſection on underſhot-wheels in the article *WATER-Works*, Parent and Pitot found, that a maximum effect was produced when the velocity of the wheel was one-third of the velocity of the water; and Deſaguliers (S), Maclaurin (T), Lambert (U), and Atwood (X), have adopted their concluſions. In the calculus from which this reſult was deduced, it was taken for granted, that the momentum or force of water upon the wheel is in the duplicate ratio of the relative velocity, or as the ſquare of the difference between the velocity of the water and that of the wheel. This ſuppoſition, indeed, is perfectly correct when the water impels a ſingle floatboard; for as the number of particles which ſtrike the floatboard in a given time, and alſo the momentum of theſe, are each as the relative velocity of the floatboards, the momentum muſt be as the ſquare of the relative velocity, that is, $M \doteqdot R^2$, M being the momentum, and R the relative velocity. But we have ſeen, in ſome of the preceding paragraphs, that the water acts on more than one floatboard at a time. Now the number of floatboards acted upon in a given time will be as the velocity of the wheel, or inverſely as the relative velocity; for if you increaſe the relative velocity, the velocity of the water remaining the ſame, you muſt diminiſh the velocity of the wheel. Conſequently, we ſhall have $M \doteqdot \frac{R^2}{R}$ or $M \doteqdot R$; that is, the momentum of the water acting upon the wheel, is directly as the relative velocity.

The force of a current impelling an undershot wheel is as the relative velocity.

280. Let V be now the velocity of the ſtream, and F the force with which it would ſtrike the floatboard at reſt, and v the velocity of the wheel. Then the relative velocity will be $V-v$; and ſince the velocity of the water will be to its momentum, or the force with which it would ſtrike the floatboard at reſt, as the relative velocity is to the real force which the water exerts againſt the moving floatboards, we ſhall have $V : V-v = F : F \times \frac{\overline{V-v}}{V} = \frac{F}{V} \times V-v$. But the effect of the wheel is meaſured by the product of the momentum of the water and the velocity of the wheel, conſequently the effect of the underſhot wheel will be $v \times \frac{F}{V} \times \overline{V-v} = \frac{F}{V} \times \overline{Vv-v^2}$. Now this effect is to be a maximum, and therefore its fluxion muſt be equal to 0, that is, v being the variable quantity, $V\dot{v} - 2v\dot{v} = 0$, or $2v\dot{v} = V\dot{v}$. Dividing by $\dot{v}$, we have $2v = V$,

(R) *Memoires des Sçavans Etrangers*, tom. i.
(S) Deſaguliers' Experimental Philoſophy, vol. ii. p. 424. lect. 12.
(T) Atwood on Rectilineal and Rotatory Motion, p. 275—284.
(U) Maclaurin's Fluxions, art. 907. p. 728.
(X) *Nouv. Memoires de l'Acad. Berlin*, 1775, p. 63.

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V, and $v=\frac{V}{2}$, that is, the velocity of the wheel will be *one-half* the velocity of the fluid when the effect is a maximum.

Confirmed by Smeaton's experiments,

281. This result, which was first obtained by the chevalier de Borda, has been amply confirmed by the experiments of Mr Smeaton. "The velocity of the stream (says he) varies at the maximum between one-third and one-half that of the water; but in all the cases in which most work is performed in proportion to the water expended, and which approach the nearest to the circumstances of great works, when properly executed, the maximum lies much nearer *one-half* than *one-third*, one half seeming to be the true maximum, if nothing were lost by the resistance of the air, the scattering of the water carried up by the wheel, &c."

and by the experiments of Bossut.

282. A result, nearly similar to this, was deduced from the experiments of Bossut. He employed a wheel whose diameter was three feet. The number of floatboards was at one time 48, and at another 24, their width being five inches, and their depth six. The experiments with the wheel, when it had 48 floatboards, were made in an inclined canal, supplied from a reservoir by an orifice two inches deep, the velocity being 300 feet in 27 seconds. The experiments with the wheel, when it had 24 floatboards, were made in a canal, contained between two vertical walls, 12 or 13 feet distant. The depth of the water was about seven or eight inches, and its mean velocity about 2740 inches in 40 seconds. The floatboards of the wheel were immersed about four inches in the stream.

Time in which the load is raised.	No. of pounds raised.	Number of turns made by the wheel.	No. of pounds raised.	Number of turns made by the wheel.
Seconds.	48 Floatboards.		24 Floatboards.	
40	$30\frac{1}{2}$	$22\frac{12}{48}$	30	$17\frac{22}{48}$
40	31	$22\frac{4}{48}$	35	$16\frac{25}{48}$
40	$31\frac{1}{2}$	$21\frac{42}{48}$	40	$15\frac{28}{48}$
40	32	$21\frac{32}{48}$	45	$14\frac{31}{48}$
40	$32\frac{1}{2}$	$21\frac{20}{48}$	50	$13\frac{34}{48}$
40	33	$21\frac{8}{48}$	55	$12\frac{37}{48}$
40	$33\frac{1}{2}$	$20\frac{44}{48}$	56	$12\frac{28}{48}$
40	34	$20\frac{32}{48}$	57	$12\frac{19}{48}$
40	$34\frac{1}{2}$	$20\frac{21}{48}$	58	$12\frac{10}{48}$
40	35	$19\frac{44}{48}$	59	$12\frac{1}{48}$
40	$35\frac{1}{2}$	$19\frac{15}{48}$	60	$11\frac{40}{48}$
40	36	$18\frac{28}{48}$	61	$11\frac{30}{48}$
40			62	$11\frac{19}{48}$
			63	$11\frac{7}{48}$
			64	$10\frac{41}{48}$
			65	$10\frac{25}{48}$
			66	$10\frac{5}{48}$

283. As the effect of the machine is measured by the product of the load raised, and the time employed, it will appear, by multiplying the second and third columns, that the effect was a maximum when the load was $34\frac{1}{2}$ pounds, the wheel performing $20\frac{21}{48}$ revolutions in 40 seconds. By comparing the velocity of the centre of impression computed from the diameter of the wheel, and the number of turns which it makes in 40 seconds, with the velocity of the current, it will be found, that the velocity of the wheel, when its effect is the greatest possible, is nearly two-fifths that of the stream. From the two last columns of the table, where the effect is a maximum when the load is 60 pounds, the same conclusion may be deduced.

Method of constructing a mill-wright's table.

284. The proper velocity of the wheel being thus established, we shall proceed to point out the method of constructing a mill-wright's table for undershot-wheels, taking it for granted, that the velocity of the wheel should be one-half the velocity of the stream, and that water moves with the same velocity as falling bodies.

1. Find the perpendicular height of the fall of water above the bottom of the mill course, and having diminished this number by one-half the depth of the water at K, call that the height of the fall. Fig. 6.

2. Since bodies acquire a velocity of 32.174 feet, by falling through the height of 16.087 feet; and as the velocities of falling bodies are as the square roots of the heights through which they fall, the square root of 16.087 will be to the square root of the height of the fall as 32.174 to a fourth number, which will be the velocity of the water. Therefore the velocity of the water may be always found by multiplying 32.174 by the square root of the height of the fall, and dividing that product by the square root of 16.087. Or it may be found more easily by multiplying the height of the fall by the constant quantity $64.348=2\times 32.174$, and extracting the square root of the product. This root, abstracting from the effects of friction, will be the velocity of the water required.

3. Take *one-half* the velocity of the water, and it will be the velocity which must be given to the floatboards, or the number of feet they must move through in a second, in order to produce a maximum effect.

4. Divide the circumference of the wheel by the velocity of its floatboards per second, and the quotient will be the number of seconds in which the wheel revolves.

5. Divide 60 by the number last found, and the quotient will be the number of turns made by the wheel in a minute.—Or the number of revolutions performed by the wheel in a minute may be found, by multiplying the velocity of the floatboards by 60, and dividing the product by the circumference of the wheel.

6. Divide 90, the number of revolutions which a millstone, five feet diameter, should make in a minute, by the number of revolutions made by the wheel in a minute; and the quotient will be the number of turns which the millstone ought to make for one revolution of the wheel.

7. Then as the number of revolutions of the wheel in a minute, is to the number of revolutions of the millstone in a minute, so must the number of staves in the trundle be to the number of teeth in the wheel, in the nearest whole numbers that can be found.

8. Multiply the number of revolutions performed by the wheel in a minute, by the number of revolutions made by the millstone for one of the wheel, and the product will be the number of revolutions made by the millstone in a minute.

285. By these rules, the following table has been computed

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computed for a water wheel 15 feet in diameter, which is a good medium ſize, the millſtone being ſeven feet in diameter, and revolving 90 times in a minute.

TABLE I. *A New Mill-Wright's Table, in which the Velocity of the Wheel is one-half the Velocity of the Stream, the effects of Friction not being conſidered.*

Height of the fall of water.	Velocity of the water per ſecond, friction not being conſidered.	Velocity of the wheel per ſecond, being one-half that of the water.	Revolutions of the wheel per minute, its diameter being 15 feet.	Revolutions of the mill-ſtone for one of the wheel.	Teeth in the wheel and ſtaves in the trundle.		Revolutions of the mill-ſtone per minute by theſe ſtaves and teeth.
Feet.	Feet. 100 parts of a foot.	Feet. 100 parts of a foot.	Revol. 100 parts of a revol.	Revol. 100 parts of a revol.	Teeth.	Staves.	Revol. 100 parts of a revol.
1	8.02	4.01	5.10	17.65	106	6	90.01
2	11.34	5.67	7.22	12.47	87	7	90.03
3	13.89	6.95	8.85	10.17	81	8	90.00
4	16.04	8.02	10.20	8.82	79	9	89.96
5	17.94	8.97	11.43	7.87	71	9	89.95
6	19.65	9.82	12.50	7.20	65	9	90.00
7	21.22	10.61	13.51	6.66	60	9	89.98
8	22.69	11.34	14.45	6.23	56	9	90.02
9	24.06	12.03	15.31	5.88	53	9	90.02
10	25.37	12.69	16.17	5.57	56	10	90.06
11	26.60	13.30	16.95	5.31	53	10	90.00
12	27.79	13.90	17.70	5.08	51	10	89.91
13	28.92	14.46	18.41	4.89	49	10	90.02
14	30.01	15.01	19.11	4.71	47	10	90.00
15	31.07	15.53	19.80	4.55	48	11	90.09
16	32.09	16.04	20.40	4.45	44	10	89.96
17	33.07	16.54	21.05	4.28	47	11	90.09
18	34.03	17.02	21.66	4.16	50	12	90.10
19	34.97	17.48	22.26	4.04	44	11	89.93
20	35.97	17.99	22.86	3.94	48	12	90.07
1	2	3	4	5	6		7

286. The preceding table, computed by Mr Brewſter, (Appendix to Ferguſon's Lectures, v. ii. p. 174.) ſuppoſes, according to theory, that the velocity of the wheel, at the maximum effect, is one-half that of the ſtream, which is nearly the caſe in practice when the quantities of water diſcharged by the ſtream are conſiderable. "When we conſider, however, (obſerves the "editor of the work now quoted) that after every "precaution has been obſerved, a ſmall quantity of "water will eſcape between the mill courſe and the extremities of the floatboards, and that the effect is diminiſhed by the reſiſtance of the air and the diſperſion of water carried up by the wheel, the propriety "of making the wheel move with three-ſevenths the "velocity of the water will appear. The chevalier de "Borda ſuppoſes it never to exceed three-eighths; and "Mr Smeaton and the abbé Boſſut found two-fifths "to be the proper medium (Y). With three-ſevenths, "therefore, as the beſt medium, which differs only "$\frac{1}{35}$th from $\frac{2}{5}$ths, the numbers in the following table "have been computed. In Table I. the water was "ſuppoſed to move with the ſame velocity as falling bodies, but owing to its friction on the mill courſe, &c. "this is not exactly the caſe. We have therefore deduced the velocity of the water in column ſecond, "from the following formula, $V = \sqrt{\frac{172}{3} \times Rb - \frac{Hh}{2}}$, Fig. 1.

"in which V is the velocity of the water, R b the abſolute height of the fall, and H h the depth of the "water at the bottom of the courſe. This formula is "founded on the experiments of Boſſut, from which it "appears, that if a canal be inclined one-tenth part of "its length, this additional declivity will reſtore that "velocity to the water which was deſtroyed by fric"tion."

TABLE II. *A New Mill-Wright's Table, in which the Velocity of the Wheel is three-ſevenths of the Velocity of the Water, and the effects of Friction on the Velocity of the ſtream reduced to computation.*

Height of the fall of water.	Velocity of the water per ſecond, friction being conſidered.	Velocity of the wheel per ſecond, being 3-7ths that of the water.	Revolutions of the wheel per minute, its diameter being 15 feet.	Revolutions of mill-ſtone for one of the wheel.	Teeth in the wheel and ſtaves in the trundle.		Revolutions of the mill-ſtone per minute, by theſe ſtaves and teeth.
Feet.	Feet. 100 parts of a foot.	Feet. 100 parts of a foot.	Revol. 100 parts of a revol.	Revol. 100 parts of a revol.	Teeth.	Staves.	Revol. 100 parts of a revol.
1	7.62	3.27	4.16	21.63	130	6	89.98
2	10.77	4.62	5.88	15.31	92	6	90.02
3	13.20	5.66	7.20	22.50	100	8	90.00
4	15.24	5.53	8.32	10.81	97	9	89.94
5	17.04	7.30	9.28	9.70	97	10	90.02
6	18.67	8.00	10.19	8.83	97	11	89.98
7	20.15	8.64	10.99	8.19	90	11	90.01
8	21.56	9.24	11.76	7.65	84	11	89.96
9	22.86	9.80	12.47	7.22	72	10	90.03
10	24.10	10.33	13.15	6.84	82	12	89.95
11	25.27	10.83	13.79	6.53	85	13	90.05
12	26.40	11.31	14.40	6.25	72	12	90.00
13	27.47	11.77	14.99	6.00	72	12	89.94
14	28.51	12.22	15.56	5.78	75	13	90.04
15	29.52	12.65	16.13	5.58	67	12	90.01
16	30.48	13.06	16.63	5.41	65	12	89.97
17	31.42	13.46	17.14	5.25	63	12	89.99
18	32.33	13.86	16.65	5.10	61	12	90.01
19	33.22	14.24	18.13	4.96	64	13	89.92
20	34.17	14.64	18.64	4.83	58	12	89.84
1	2	3	4	5	6		7

287.

(Y) The great hydraulic machine at Marly was found to produce a maximum effect, when its velocity was two-fifths that of the ſtream.

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Method of using the table.

287. In order that the wheel may move with a velocity duly adjusted to that of the current, we would not advise the mechanic to trust to the second column of Table II. for the true velocity of the stream, or to any theoretical results, even when deduced from formulæ founded on experiments. Bossut, with great justice, remarks, that "it would not be exact in practice to compute the velocity of a current from its declivity. This velocity ought to be determined by immediate experiment in every particular case." Let the velocity of the water, therefore, where it strikes the wheel, be determined by the method in the following paragraph. With this velocity, as an argument, enter column second of either of these tables, according as the velocity of the wheel is to be one-half or three-sevenths that of the stream, and take out the other numbers from the table.

Different methods of measuring the velocity of the stream.

288. Various methods have been proposed by different philosophers for measuring the velocity of running water; the method, by floating bodies, which Mariotte (Z) employed, the bent tube of Pitot (A), the regulator of Guglielmini (B), the quadrant (C), the little wheel (D), and the method proposed by the abbé Mann (E), have each their advantages and disadvantages. The little wheel was employed in the experiments of Bossut. It is the most convenient mode of determining the superficial velocity of the water; and, when constructed in the following manner, will be more accurate, it is hoped, than any instrument that has hitherto been used.

Simple instrument for this purpose. Plate CCLXX. Fig. 4.

The small wheel WW should be formed of the lightest materials. It should be about 10 or 12 inches in diameter, and furnished with 14 or 16 floatboards. This wheel moves upon a delicate screw *a* B, passing through its axle B *b*; and when impelled by the stream it will gradually approach towards D, each revolution of the wheel corresponding with a thread of the screw. The number of revolutions performed in a given time are determined upon the scale *m a*, by means of the index O *h* fixed at O, and moveable with the wheel, each division of the scale being equal to the breadth of a thread of the screw, and the extremity *h* of the index O *h* coinciding with the beginning of the scale, when the shoulder *b* of the wheel is screwed close to *a*. The parts of a revolution are indicated by the bent index *m n* pointing to the periphery of the wheel, which is divided into 100 parts. When this instrument is to be used, take it by the handles C, D, or when great accuracy is required, make it rest on the handles C, D; and screw the shoulder *b* of the wheel close to *a*, so that the indices may both point to *o* the commencement of the scales. Then, by means of a stop-watch or pendulum, find how many revolutions of the wheel are performed in a given time. Multiply the mean circumference of the wheel (or the circumference deduced from the mean radius, which is equal to the distance of the centre of impulsion or impression from the axis *b* B) by the number of revolutions, and the product will be the number of feet through which the water moves in the given time. On account of the friction of the screw, the resistance of the air, and the weight of the wheel, its centre of impression will revolve with a little less velocity than that of the stream; but the diminution of velocity, arising from these causes, may be estimated with sufficient precision for all the purposes of the practical mechanic. (*Appendix to Ferguson's Lectures*, vol. ii. p. 177.)

Results of Smeaton's experiments.

289. It appears, from a comparison of the numerous and accurate experiments of Mr Smeaton, that, in undershot-wheels, the power employed to turn the wheel is to the effect produced as 3 to 1; and that the load which the wheel will carry at its maximum, is to the load which will totally stop it, as 3 to 4. The same experiments inform us, that the impulse of the water on the wheel, in the case of a maximum, is more than double of what is assigned by theory, that is, instead of four-sevenths of the column, it is nearly equal to the whole column. In order to account for this, Mr Smeaton observes, that the wheel was not, in this case, placed in an open river, where the natural current, after it had communicated its impulse to the float, has room on all sides to escape, as the theory supposes; but in a conduit or race, to which the float being adapted, the water could not otherwise escape than by moving along with the wheel. He likewise remarks, that when a wheel works in this manner, the water, as soon as it meets the float, receives a sudden check, and rises up against it like a wave against a fixed object; insomuch, that when the sheet of water is not a quarter of an inch thick before it meets the float, yet this sheet will act upon the whole surface of a float, whose height is three inches. Were the float, therefore, no higher than the thickness of the sheet of water, as the theory supposes, a great part of the force would be lost by the water dashing over it. In order to try what would be the effect of diminishing the number of floatboards, Mr Smeaton reduced the floatboards, which were originally 24 to 12. This change produced a diminution of the effect, as a greater quantity of water escaped between the floats and the floor. But when a circular sweep was adapted to the floor, and made of such a length that one float entered the curve before the preceding one quitted it, the effect came so near to the former, as to afford no hopes of increasing it by augmenting the number of floats beyond 24 in this particular wheel. Mr Smeaton likewise deduced, from his experiments, the following maxims.

1. That the virtual or effective head being the same, the effect will be nearly as the quantity of water expended.

2. That

(Z) *Traité du Mouvement des Eaux.*
(A) *Mem. de l'Acad. Paris*, 1732.
(B) *Aquarum Fluentium Mensura*, lib. iv.
(C) Bossut *Traité d'Hydrodynamique*, art. 654.
(D) Id. id. art. 655.
(E) Philosophical Transactions, vol. lxix.

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2. That the expence of water being the fame, the effect will be nearly as the height of the virtual or effective head.

3. That the quantity of water expended being the fame, the effect is nearly as the fquare of the velocity.

4. The aperture being the fame, the effect will be nearly as the cube of the velocity of the water.

Underfhot wheels with floatboards inclined to the plane of the wheel, Plate CCLXX. Fig. 5.

290. We have hitherto fuppofed the floatboards, though inclined to the radius, to be perpendicular to the plane of the wheel. Underfhot-wheels, however, have fometimes been conftructed with floatboards inclined to the plane of the wheel. A wheel of this kind is reprefented in fig. 5. where AB is the wheel, and CDEFGH the oblique floatboards. The horizontal current MN is delivered on the floatboards, fo as to ftrike them perpendicularly. On account of the fize of the floatboards, every filament of the water contributes to turn the wheel; and therefore its effect will be greater than in underfhot-wheels of the common form. Albert Euler imagines that the effect will be twice as great, and obferves, that in order to produce fuch an effect, the velocity of the centre of impreffion fhould be to the velocity of the water, as radius is to triple the fine of the angle by which the floatboards are inclined to the plane of the wheel. If this inclination, therefore, be 60°, the velocity of the wheel at the centre of impreffion ought to be to the velocity of the impelling fluid as 1 to $\frac{3\sqrt{3}}{2}$, that is, as 5 to 13 nearly, becaufe Sin. $60° = \frac{\sqrt{3}}{2}$. When the inclination is 30°, the ratio of the velocities will be found to be as 2 to 3.

and alfo to the radius.

291. In wheels of this kind, the floats may alfo be advantageoufly inclined to the radius. In this cafe, the ftream, which ftill ftrikes them perpendicularly, is inclined to the horizon. If the angle formed by the common fection of the wheel and floatboards with the radius of the wheel, be $= m$; and if the angle by which the floatboards are inclined to the plane of the wheel be $= n$, then the angle which the floatboards fhould form with the direction in which the wheel moves, will be $= \overline{\text{Cof. } m \times \text{Sin. } n}$. In order, therefore, that the ftream may ftrike the floatboards with a perpendicular impulfe, its inclination to the horizon muft be $= m$, and its inclination to the plane of the wheel $= 90° - n$. The lefs that the velocity of the water is, the greater fhould be the angle m; for there is, in this cafe, no danger that the celerity of the wheel be too great. The area of the floatboards ought to be much greater than the fection of the current; and the interval between two adjacent floatboards fhould be fo great, that before the one completely withdraws itfelf from the action of the water, the other fhould begin to receive its impulfe.

On horizontal water-wheels. Fig. 6.

292. Horizontal water-wheels have been much ufed on the continent, and are ftrongly recommended to our notice by the fimplicity of their conftruction. In fig. 6. AB is the large water wheel which moves horizontally upon its arbor CD. This arbor paffes through the immoveable millftone EF at D, and being fixed to the upper one GH, carries it once round for every revolution of the great wheel. The mill-courfe is conftructed in the fame manner for horizontal as for vertical wheels, with this difference only, that the part m B n C, fig. 2. of which KL in fig. 1. is a fection, inftead of being rectilineal like $m\,n$, muft be circular like m P, and concentric with the rim of the wheel, fufficient room being left between it and the tips of the floatboards for the play of the wheel. In this conftruction, where the water moves in a horizontal direction before it ftrikes the wheel, the floatboards fhould be inclined about 25° to the plane of the wheel, and the fame number of degrees to the radius, fo that the loweft and outermoft fides of the floatboards may be fartheft up the ftream.

293. Inftead of making the canal horizontal before it delivers the water on the floatboards, they are frequently inclined in fuch a manner as to receive the impulfe perpendicularly, and in the direction of the declivity of the mill-courfe. When this conftruction is adopted, the maximum effect will be produced when the velocity of the floatboards is not lefs than $\frac{5.67\sqrt{H}}{2 \text{ Sin. } A}$, where H reprefents the height of the fall, and A the the angle which the direction of the fall makes with a vertical line. But as the quantity $\frac{5.67\sqrt{H}}{2 \text{ Sin. } A}$ evidently increafes as the fine of A decreafes, it follows, that without leffening the effect of thefe wheels, we may diminifh the angle A, and thus augment confiderably the velocity of the floatboards, according to the nature of the machinery employed; whereas, in vertical wheels, there is only one determinate velocity which produces a maximum effect.

With curvilineal floatboards.

294. In the fouthern provinces of France, where horizontal wheels are generally employed, the floatboards are made of a curvilineal form, fo as to be concave towards the ftream. The Chevalier de Borda obferves, that in theory a double effect is produced when the floatboards are concave; but that the effect is diminifhed in practice, from the difficulty of making the fluid enter and leave the curve in a proper direction. Notwithftanding this difficulty, however, and other defects which might be pointed out, horizontal wheels with concave floatboards are always fuperior to thofe in which the floatboards are plain, and even to vertical wheels, when there is a fufficient fall of water. When the floatboards are plane, the wheel is driven merely by the impulfe of the ftream; but when they are concave, a part of the water acts by its weight and increafes the velocity of the wheel. If the fall of water be 5 or 6 feet, a horizontal wheel with concave floatboards may be erected, whofe maximum effect will be to that of the ordinary vertical wheels as 3 to 2.

295. An advantage attending horizontal wheels is, that the water may be divided into feveral canals, and delivered upon feveral floatboards at the fame time. Each ftream will heap up on its correfponding floatboard, and produce a greater effect than if the force of the water had been concentrated on a fingle floatboard. Horizontal wheels may be employed with greateft advantage when a fmall quantity of water falls through a confiderable height.

Overfhot wheels fuperior to underfhot ones.

296. It has been difputed among mechanical philofophers, whether overfhot or underfhot wheels produce the greateft effect. M. Belidor maintained that the former were inferior to the latter, while a contrary opinion was

was entertained by Deſaguliers. It appears, however, from Mr Smeaton's experiments, that in overſhot wheels the power is to the effect nearly as 3 to 2 or as 5 to 4 in general, whereas in underſhot wheels it is only as 3 to 1. The effect of overſhot wheels therefore is nearly double that of underſhot wheels, other circumſtances being the ſame. In comparng the relative effects of water-wheels, the Chevalier de Borda remarks that overſhot wheels will raiſe through the height of the fall, a quantity of water equal to that by which they are driven; that underſhot vertical wheels will produce only three-eighths of this effect; that horizontal wheels will produce a little leſs than one-half of it when the floatboards are plain, and a little more than one half of it when the floatboards have a curvilineal form.

Beſant's Underſhot Wheel.

Deſcription of Beſant's water-wheel. Plate. CCLXXI. Fig. 1.

297. The water-wheel invented by Mr Beſant of Brompton is conſtructed in the form of a hollow drum, ſo as to reſiſt the admiſſion of the water. The floatboards are fixed obliquely in pairs on the periphery of the wheel, ſo that each pair may form an acute angle open at its vertex, while one of the floatboards extends beyond the vertex of the angle. A ſection of the water wheel is repreſented in fig. 1. where AB is the wheel, CD its axis, and *m n*, *o p* the poſition of the floatboards. The motion of common underſhot wheels is greatly retarded by the reſiſtance which the tail-water and the atmoſphere oppoſe to the aſcending floatboards; but in Beſant's wheel this reſiſtance is greatly diminiſhed, as the floats emerge from the ſtream in an oblique direction. Although this wheel is much heavier than thoſe of the common conſtruction, yet it revolves more eaſily upon its axis, as the ſtream has a tendency to make it float.

Conical Horizontal Wheel with Spiral Floatboards.

Deſcription of a conical horizontal wheel with ſpiral floatboards. Fig. 2.

298. In Guyenne and Languedoc, in the ſouth of France, a kind of conical horizontal wheel is ſometimes employed for turning machinery. It is conſtructed in the form of an inverted cone AB, with ſpiral floatboards winding round its ſurface. The wheel moves on a vertical axis AB, in the building DD, and is driven chiefly by the impulſe of the water conveyed by the canal C to the oblique floatboards, the direction of the current being perpendicular to the floatboards at the place of impact. When the impulſive force of the water is annihilated, it deſcends along the ſpirals, and continues to act by its weight till it reaches the bottom, when it is carried off by the canal M.

Chap. II. *On Machines driven by the Reaction of Water.*

Water produces greater effects by its reaction than by its impulſe or weight.

299. We have hitherto conſidered the mechanical effects of water as the impelling power of machinery, when it acts either by its impulſe or by its gravity. The reaction of water may be employed to communicate motion to machinery; and though this principle has not yet been adopted in practice, it appears from theory, and from ſome detached experiments on a ſmall ſcale, that a given quantity of water, falling through a given height, will produce greater effects by its reaction than by its impulſe or its weight.

Sect. I. *On Dr Barker's Mill.*

Deſcription of Dr Barker's mill. Plate CCLXXI. Fig. 3.

300. This machine, which is ſometimes called Parent's mill, is repreſented in figure 3. where A is the canal that conveys the water into the upright tube B, which communicates with the horizontal arm C. The water will therefore deſcend through the upright tube into this arm, and will exert upon the inſide of it a preſſure proportioned to the height of the fall. But if two orifices *d* and *e* be perforated at the extremities of the arm, and on contrary ſides, the preſſure upon theſe orifices will be removed by the efflux of the water, and the unbalanced preſſure upon the oppoſite ſides of the arm will make the tube and the horizontal arm revolve upon the ſpindle D as an axis. This will be more eaſily underſtood, if we ſuppoſe the orifices to be ſhut up, and conſider the preſſure upon a circular inch of the arm oppoſite to the orifice, the orifice being of the ſame ſize. The preſſure upon this circular inch will be equal to a cylinder of water whoſe baſe is one inch in diameter, and whoſe altitude is the height of the fall; and the ſame force is exerted upon the ſhut-up orifice. Theſe two preſſures, therefore, being equal and oppoſite, the arm C will remain at reſt. But as ſoon as you open the orifice, the water will iſſue with a velocity due to the height of the fall: the preſſure upon the orifice will of conſequence be removed; and as the preſſure upon the circular inch oppoſite to the orifice ſtill continues, the equilibrium will be deſtroyed, and the arm C will move in a retrograde direction.

301. The upright ſpindle D, on which the arm revolves, is fixed in the bottom of the arm, and ſcrewed to it below by the nut *g*. It is fixed to the upright tube by two croſs bars at *f*, ſo as to move along with it. If a corn mill is to be driven, the top of the ſpindle is fixed into the upper millſtone H. The lower quieſcent millſtone I reſts upon the floor K, in which is the hole L, to let the meal paſs into a trough about M. The bridgetree GF, which ſupports the millſtone, tube, &c. is moveable on a pin at *h*, and its other end is ſupported by an iron rod fixed into it, the top of the rod going through the fixed bracket o, furniſhed with a nut *o*. By ſcrewing this nut, the millſtone may be raiſed or lowered at pleaſure. If any other kind of machinery is to be driven, the ſpindle D muſt be prolonged to X, and a ſmall wheel W fixed to its extremity, which will communicate its motion to any ſpecies of mechaniſm. An improvement on this machine by M. Mathon de la Cour, and ſome excellent obſervations on the ſubject by Profeſſor Robiſon, will be found in the article *Water-Works*.

302. Mr Waring of the American Philoſophical Society, has given a theory of Barker's mill with the improvement of M. Mathon de la Cour, which he has ſtrangely aſcribed to a Mr Rumſey about 20 years after it was publiſhed in *Rozier's Journal de Phyſique*, Jan. and Auguſt 1775. Contrary to every other philoſopher, he makes the effect of the machine equal only to that of a good underſhot wheel, moved with the ſame quantity of water, falling through the ſame height. The following

Machines driven by the Reaction of Water.

lowing rules, however, deduced from his calculus may be of use to those who may wish to make experiments on the effect of this interesting machine.

Practical rules.

1. Make the arm of the rotatory tube or arm C, from the centre of motion to the centre of the aperture, of any convenient length, not less than one-third (one-ninth according to Mr Gregory (F), who has corrected some of Waring's numbers) of the perpendicular height of the water's surface above their centres.

2. Multiply the length of the arm in feet by .614, and take the square root of the product for the proper time of a revolution in seconds, and adapt the other parts of the machinery to this velocity; or, if the time of a revolution be given, multiply the square of this time by 1.63 for the proportional length of the arm.

3. Multiply together the breadth, depth, and velocity per second, of the race, and divide the last product by 18.47 times (14.27 according to Mr Gregory) the square root of the height, for the area of either aperture.

4. Multiply the area of either aperture by the height of the fall of water, and the product by $41\frac{2}{3}$ pounds (55.775 according to Mr Gregory), for the moving force estimated at the centres of the apertures in pounds avoirdupois.

5. The power and velocity at the aperture may be easily reduced to any part of the machinery by the simplest mechanical rules.

Form given to Barker's mill by Professor Lynes.

303. Long after the preceding machine had been described in several of our English treatises on machines, Professor Segner published in his hydraulics, as an invention of his own, the account of a machine, differing from this only in form. MN was the axis of the machine, corresponding with DX in Barker's mill, and a number of tubes AB were also so arranged round this axis that their higher extremities A formed a circular superficies into which the water flowed from a reservoir. When the machine has this form, it has been shown by Albert Euler that the maximum effect is produced when the velocity is infinite, and that the effect is equal to the power. As a considerable portion of the power, however, must be consumed in communicating to the fluid the circular motion of the tubes; and as the portion thus lost must increase with the velocity of the tube, the effect will in reality sustain a diminution from an increase of velocity.

Fig. 4.

Machines driven by the Reaction of Water.

Sect. II. *Description of Albert Euler's Machine, driven by the Reaction of the Water.*

Plate CCLXXI. Fig. 5.

304. This machine consists of two vessels, the lowest of which EEFF is moveable round the vertical axis OO, while the higher vessel remains immoveable. The form of the lowest vessel, which is represented by itself in fig. 6. is similar to that of a truncated bell, which is fastened by the cross beams *m*, *n* to the axis O so as to move along with it. The annular cavity *hhhh*, terminates at *ee* in several tubes *ef*, *ef*, *ef*, diverging from the axis. Through the lower extremities of these tubes, which are bent into a right angle, the water flowing from the cavity *hhhh* issues with a velocity due to the altitude of its surface in *h*, *h*, and produces by its reaction a rotatory and retrograde motion round the axis OO. The cavity of the ring *h*, *h*, receives the water from the superior vessel GGHH, similar to the inferior vessel in fig. 6. but not connected with the axis OO. This vessel has also an annular cavity PP, into which the water is conveyed from a reservoir by the canal R. Around the lower part HH of the cavity, this vessel is divided into several apertures I *i*, placed obliquely that the water may descend with proper obliquity into the inferior vessel. The width of the higher vessel at HH ought to be equal to the width of the lower vessel at EE, that the water which issues from the former may exactly fill the annular cavity *h*, *h*, *h*, *h*.

Fig. 6.

When the machine is constructed in this way, its maximum effect will be equal to the power, provided all its parts be proportioned and adjusted according to the results in the following table, computed from the formulæ of Albert Euler. In the table,

Q = the quantity of water, or number of cubic feet of water furnished in a second.

T = the time, or number of seconds in which the lower vessel revolves.

B = the breadth of the annular orifice in inches.

(F) Gregory's Mechanics, vol. ii. p. 111.

Machines driven by the Reaction of Water.

Machines driven by the Reaction of Water.

Table for mills driven by the reaction of water.

TABLE *for Mills driven by the Reaction of Water.*

Height of the fall of water.	Sum of the areas of all the orifices at *f*, *f*, *f*, &c.	Sum of the areas of all the orifices at *f*, *f*, *f*, &c.	Mean radius of the annular orifice HH.	Difference between the altitude of the two veſſels.	Tangent of the inclination of the tubes to the horizon.
Feet.	Square Feet.	Square Inches.	Feet.	Inches.	
1	$0.17888\times Q$	$25.759\times Q$	$0.8897\times T$	$1.7695\frac{QQ}{TTBB}$	$0.38400\frac{Q}{TB}$
2	$0.12649\times Q$	$18.214\times Q$	$1.2582\times T$	$0.8847\frac{QQ}{TTBB}$	$0.19200\frac{Q}{TB}$
3	$0.103228\times Q$	$14.872\times Q$	$1.5410\times T$	$0.5898\frac{QQ}{TTBB}$	$0.12800\frac{Q}{TB}$
4	$0.08944\times Q$	$12.880\times Q$	$1.7794\times T$	$0.4424\frac{QQ}{TTBB}$	$0.09600\frac{Q}{TB}$
5	$0.08000\times Q$	$11.520\times Q$	$1.9894\times T$	$0.3539\frac{QQ}{TTBB}$	$0.07680\frac{Q}{TB}$
6	$0.07303\times Q$	$10.516\times Q$	$2.1793\times T$	$0.2949\frac{QQ}{TTBB}$	$0.06400\frac{Q}{TB}$
7	$0.06761\times Q$	$9.736\times Q$	$2.3540\times T$	$0.2528\frac{QQ}{TTBB}$	$0.05486\frac{Q}{TB}$
8	$0.06325\times Q$	$9.107\times Q$	$2.5165\times T$	$0.2212\frac{QQ}{TTBB}$	$0.04800\frac{Q}{TB}$
9	$0.05963\times Q$	$.8586\times Q$	$2.6691\times T$	$0.1966\frac{QQ}{TTBB}$	$0.04267\frac{Q}{TB}$
10	$0.05657\times Q$	$8.146\times Q$	$2.8135\times T$	$0.1769\frac{QQ}{TTBB}$	$0.03840\frac{Q}{TB}$
11	$0.05394\times Q$	$7.767\times Q$	$2.9508\times T$	$0.1609\frac{QQ}{TTBB}$	$0.03491\frac{Q}{TB}$
12	$0.05104\times Q$	$7.436\times Q$	$3.0820\times T$	$0.1475\frac{QQ}{TTBB}$	$0.03200\frac{Q}{TB}$
13	$0.04961\times Q$	$7.144\times Q$	$3.2078\times T$	$0.1361\frac{QQ}{TTBB}$	$0.02954\frac{Q}{TB}$
14	$0.04781\times Q$	$6.885\times Q$	$3.3290\times T$	$0.1264\frac{QQ}{TTBB}$	$0.02743\frac{Q}{TB}$
15	$0.04619\times Q$	$6.651\times Q$	$3.4458\times T$	$0.1179\frac{QQ}{TTBB}$	$0.02560\frac{Q}{TB}$
16	$0.04472\times Q$	$6.440\times Q$	$3.5588\times T$	$0.1106\frac{QQ}{TTBB}$	$0.02400\frac{Q}{TB}$
17	$0.04339\times Q$	$6.248\times Q$	$3.6683\times T$	$0.1041\frac{QQ}{TTBB}$	$0.02259\frac{Q}{TB}$
18	$0.04216\times Q$	$6.072\times Q$	$3.7747\times T$	$0.0983\frac{QQ}{TTBB}$	$0.02133\frac{Q}{TB}$
1	2	3	4	5	6

Explanation of the table.

The determinations in the preceding table are exhibited in a general manner, that the machine may be accommodated to local circumſtances. The time of a revolution T, for inſtance, is left undetermined, becauſe upon this time depends the magnitude of the machine; and T may be aſſumed of ſuch a value that the dimenſions of the machine may be ſuitable to the given place, or to the nature of the work to be performed.

Example.

305. In order to ſhew the application of the preceding table, let it be required to conſtruct the machine when the height of the fall is five feet, and when the reſervoir furniſhes one cubic foot of water in a ſecond. In this caſe $Q=1$, and therefore, by column 3d, the ſum of the areas of the orifices will be 11.52 ſquare inches. Conſequently, if there are twelve orifices, the area of each orifice will be $\frac{11.52}{12}=0.96$ of a ſquare inch. Suppoſe the time of a revolution to be $=1$ ſecond or $T=1$, then the 4th column will give the mean radius of the annular orifice $=1.9894$ feet, or nearly two feet. Let the breadth of the annular orifice or $B=\frac{1}{2}$ an inch, then the difference between the altitude of

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of each veſſel will be $0.3539 \times \frac{QQ}{TTBB} = 0.3539 \times \frac{1 \times 1}{\frac{1}{2} \times \frac{1}{2} \times 1 \times 1} = 0.3539 \times \frac{1}{\frac{1}{4}} = 0.3539 \times 4 = 1.4156$ inches. Now as the ſum of the heights of the veſſels muſt be always equal to the height of the fall, half that ſum will in the preſent caſe be two feet ſix inches; and ſince half the difference of their altitudes is 7-tenths of an inch, the altitude of the ſuperior veſſel will be two feet ſix inches and ſeven-tenths, and that of the inferior veſſel two feet five inches and three-tenths. It appears from the laſt column of the table, that the tangent of the inclination of the tubes is 0.1536, which correſponds with an angle of 8° 44′.

Reference to the reſearches of Leonhard Euler.

306. The theory of this machine has alſo been diſcuſſed by Leonhard Euler in the *Mem. de l'Acad. Berlin*, vol. vi. p. 311; and its application to all kinds of work has been pointed out in a ſubſequent paper, entitled, *Application de la Machine Hydraulique de M. Segner à toutes ſorts d'ouvrage, et de ſes avantages ſur les autres Machines Hydrauliques dont on ſe ſert ordinairement*, Mem. Acad. Berlin, tom. vii. 1752, p. 271. The reſults of Euler's analyſis are not ſufficiently practical for the uſe of the general reader. But it appears from his inveſtigations, as well as from thoſe of John Bernouilli and other philoſophers, that the reaction of water is the moſt powerful way in which the force of that fluid can be employed.

New kind of water-wheel ſuggeſted.

Plate CCLXXI. Fig. 2.

307. It has often occurred to the writer of this article, that a very powerful hydraulic machine might be conſtructed by combining the impulſe with the reaction of water. If the ſpout *a*, for example, inſtead of delivering the water into the higher veſſel, were to throw it upon a number of curvilineal floatboards fixed on its circumference, and ſo formed as to convey the water eaſily into the ſpiral canals, we ſhould have a machine ſomething like the conical horizontal wheel in fig. 2. with ſpiral channels inſtead of ſpiral floatboards; and which would in ſome meaſure be moved both by the impulſe, weight, and reaction of the water.

Chap. III. *On Machines for raiſing Water.*

Sect. I. *On Pumps.*

Reference to the article Pump.

308. The ſubject of pumps has been fully and ably diſcuſſed by Dr Robiſon under the article Pump, to which we muſt refer the reader for a complete view of the theory of the machine. In that article, however, a reference is made to the preſent for a deſcription of the ancient pump of Cteſibius, and of thoſe in common uſe to which it has given riſe. To theſe ſubjects, therefore, we muſt now confine our attention.

Deſcription of the original pump of Cteſibius.

Plate CCLXXII. Fig. 1.

309. The pump was invented by Cteſibius, a mathematician of Alexandria, who flouriſhed under Ptolemy Pſychon, about 120 years before Chriſt. In its original ſtate it is repreſented in fig. 1. where ABCD is a braſs cylinder with a valve L in its bottom. It is furniſhed with a piſton MK made of green wood, ſo as not to ſwell in water, and adjuſted to the bore of the cylinder by the interpoſition of a ring of leather. The tube CI connects the cylinder ABCD with another tube NH, the bottom of which is furniſhed with a valve I opening upwards. Now when the extremity DC of the cylinder is immerſed in water, and the piſton MK elevated, the preſſure of the water upon the valve L from below will be proportioned to the depth below the ſurface (41). The valve will therefore open and admit the water into the cylinder. But when the piſton is depreſſed, it will force the water into the tube CH, and through the valve I into the tube NH. As ſoon as the portion of water that was admitted into the cylinder ABCD, is thus impelled into the tube NH, the valve I will cloſe. A ſecond elevation of the piſton will admit another quantity of fluid into the cylinder, and a ſecond depreſſion will force it into the tube NH; ſo that, by continuing the motion of the piſton, the water may be elevated to any altitude in the tube. From this pump of Cteſibius are derived the three kinds of pumps now commonly uſed, the ſucking, the forcing, and the lifting pump.

Deſcription of the ſucking pump. Fig. 2.

310. The common ſucking pump is repreſented in fig. 2. where ICBL is the body of the pump immerſed in the water at A. The moveable piſton DG is compoſed of the piſton rod D *d*, the piſton or bucket G, and the valve *a*: The bucket H which is fixed to the body of the pump, is likewiſe furniſhed with a valve *b*, which, like the valve *a*, ſhould by its own weight lie cloſe upon the hole in the bucket till the working of the engine commences. The valves are made of braſs, and have their lower ſurface covered with leather, in order to fit the holes in the bucket more exactly. The moveable bucket G is covered with leather, ſo as to ſuit exactly the bore of the cylinder, and prevent any air from eſcaping between it and the pump. The piſton DG may be elevated or depreſſed by the lever DQ, whoſe fulcrum is *r*, the extremity of the bent arm R *r*.

Mode of operation.

311. Let us now ſuppoſe the piſton G to be depreſſed ſo that its inferior ſurface may reſt upon the valve *b*. Then if the piſton G be raiſed to C, there would have been a vacuum between H and G if the valve *b* were immoveable. But as the valve *b* is moveable, and as the preſſure of the air is removed from its ſuperior ſurface, the air in the tube HL will, by its elaſticity, force open the valve *b*, and expand itſelf through the whole cavity LC. This air, however, will be much rarer than that of the atmoſphere; and ſince the equilibrium between the external air and that in the tube LH is deſtroyed by the rarefaction of the latter, the preſſure of the atmoſphere on the ſurface of the water in the veſſel K will predominate, and raiſe the water to about *e* in the ſuction pipe HL, ſo that the air formerly included in the ſpace LC will be condenſed to the ſame ſtate as that of the atmoſphere. The elaſticity of the air both above and below the valve *b* being now equal, that valve will fall by its own weight.—Let the piſton DG be now depreſſed to *b*. The air would evidently reſiſt its deſcent, did not the valve *a* open and give a free exit to the air in the ſpace CH, for it cannot eſcape through the inferior valve *b*. When the piſton reaches *b*, the valve *a* will fall by its weight; and when the piſton is again elevated, the incumbent air will preſs the valve *a* firmly upon its orifice. During the ſecond aſcent of the piſton to C the valve *b* will riſe, the air between *e* H will ruſh into HC; and in conſequence of its rarefaction, and inability to counteract the preſſure of the atmoſphere, the water will riſe to *f*. In the ſame way it may be ſhewn, that at the next ſtroke of the piſton the water will riſe through the box H to B, and

On Machines for raising Water. and then the valve *b* which was raised by it will fall when the bucket G is at C. Upon depressing the bucket G again, the water cannot be driven through the valve *b*, which is pressed to its orifice by the water above it. At the next ascent of the piston a new quantity of water will rise through H, and follow the piston to C. When the piston again descends the valve *a* will open; and as the water between C and H cannot be pushed through the valve *b*, it will rise through *a*, and have its surface at C when the piston G is at *b*; but when the piston rises, the valve *a* being shut by the water above it, this water will be raised up towards I, and issue at the pipe F. A new quantity of water will rush through H and fill the space HC; consequently, the surface of the fluid will always remain at C, and every succeeding elevation of the piston from *b* to C will make the column of water CH run out at the pipe F.

The sucking-pump will not raise water higher than 33 feet. 312. As the water rises in the pipe CL solely by the pressure of the atmosphere; and as a column of water, 33 feet high, is equal in weight to a column of air of the same base, reaching from the earth's surface to the top of the atmosphere, the water in the vessel K will not follow the piston G to a greater altitude than 33 feet; for when it reaches this height, the column of water completely balances, or is in equilibrium with, the atmosphere, and therefore cannot be raised higher by the pressure of the external air.

Description of the forcing-pump. 313. The forcing pump is represented in fig. 3. where D*d* is the piston attached to a solid plunger *g*, adjusted to the bore of the pipe BC by the interposition of a ring of leather. Plate CCLXXII. Fig. 3. The rectangular pipe MMN communicates with the tube BC by the cavity round H; and its upper extremity P is furnished with a valve *a* opening upwards. An air-vessel KK is fastened to P, and the tube FGI is introduced into it so as to reach as near as possible to the valve *a*.—Mode of its operation. Let us now suppose the plunger D*g* to be depressed to *b*. As soon as it is elevated to C the air below it will be rarefied, and the water will ascend through the valve *b* in the same way as in the sucking pump, till the pipe is filled to C. The valve *b* will now be shut by the weight of the incumbent water; and therefore when the plunger D*g* is depressed, it will force the water between C and *b* through the rectangular pipe MMN, into the air vessel KK. Before the water enters the air vessel, it opens the valve *a*, which shuts as soon as the plunger is again raised, because the pressure of the water upon its under side is removed. In this way the water is driven into the air vessel by repeated strokes of the plunger, till its surface is above the lower extremity of the pipe IG. Now, as the air in the vessel KK has no communication with the external air when the water is above I, it must be condensed more and more, as new quantities of water are injected. It will therefore endeavour to expand itself, and by pressing upon the surface H of the water in the air vessel, it will drive the water through the tube IG, and make it issue at F in a continued stream, even when the plunger is rising to C. If the pipe GHI were joined to the pipe MMN at P, without the intervention of an air vessel, the stream of water would issue at F only when the plunger was depressed.

314. The lifting pump, which is only a particular modification of the forcing pump, is represented in fig. 4. The barrel AB is fixed in the immoveable frame KILM the lower part of which is immersed in the water to be raised. The frame GEQHO consists of two strong iron rods EQ,GH which move through holes in IK and LM, the upper and lower ends of the pump. To the bottom GH of this frame is fixed an inverted piston with its bucket and valve uppermost at D. An inclined branch KH, either fixed to the top of the barrel, or moveable by a ball and socket, as represented at F, must be fitted to the barrel so exactly as to resist the admission both of air and water. The branch KH is furnished with a valve C opening upwards. Let the pump be now plunged in the water to the depth of D. Then if the piston frame be thrust down into the fluid, the piston will descend, and the water by its upward pressure will open the valve at D and gain admission above the piston. When the piston frame is elevated, it will raise the water above D along with it, and forcing it through the valve, it will be carried off by the spout.

Description of the lifting pump. Fig. 4. Mode of its operation.

De la Hire's pump. 315. An ingenious pump, invented by De la Hire, is represented in fig. 5. It raises water equally quick by the descent as by the ascent of the piston. Fig. 5. The pipes B, C, E, F, all communicate with the barrel MD, and have each a valve at their top, viz. at *b*, S, *e*, *f*. The piston rod LM and plunger K never rise higher than K, nor descend lower than D, KD being the length of the stroke. When the plunger K is raised from D to K the pressure of the atmosphere forces the water through the valve *b*, and fills the barrel up to the plunger, in the very same way as in the forcing pump. When the plunger K is depressed to D, it forces the water between K and *b* up the pipe F and through the valve *e* into the box G, where it issues at the orifice O. During the descent of the plunger K the valve *f* falls, and covers the top of the pipe F; and as the piston-rod LM moves in a collar of leather at M, and is air-tight, the air above the plunger, between Q and M, will be rarefied, and likewise the air in the pipe CS, which communicates with the rarefied air by the valve S. The pressure of the air therefore will raise the water in CS, force it through the valve S, and fill the space above the plunger, expelling the rarefied air through the valve *f*. When the piston is raised from D to K, it will force the water through the bent pipe F into the box G, so that the same quantity of water will be discharged at O through the pipe F, during the ascent of the piston, as was discharged through the pipe E during the piston's descent. Above the pipe O is a close air-vessel D, so that when the water is driven above the spout O, it compresses the air in the vessel P, and this air acting by its elasticity on the surface of the water, forces it out at O in a constant and nearly equal stream. As the effect of the machine depends on a proper proportion between the height O of the spout above the surface of the well, and the diameter of the barrel, the following table will be of use to the practical mechanic.

Height

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Height of the spout O above the well.	Diameter of the barrel D.	Height of the spout O above the well.	Diameter of the barrel D.
Feet.	Inches.	Feet.	Inches.
10	6.9	60	2.8
15	5.6	65	2.7
20	4.9	70	2.6
25	4.4	75	2.5
30	4.0	80	2.5
35	3.7	85	2.4
40	3.5	90	2.3
45	3.3	95	2.2
50	3.1	100	2.1

When the proportions in the preceding table are obferved, a man of common ftrength will raife water much higher than he could do with a pump of the common conftruction.

Noble's pump. Fig. 6.

316. A very fimple pump which furnifhes a continued ftream is reprefented in fig. 6. It was invented by a Mr Noble, and confifts of a working barrel AB with two piftons C and B, which are moved up and down alternately by the rods fixed to the lever EMN. The rod of the pifton B paffes through the pifton C, and the pifton C moves upon the rod AB. When the pifton rod B is depreffed and elevated, it will make the water rife in the barrel A, in the fame way as in the fucking pump, whether the valve C be moveable or not. Let us now fuppofe that the water is raifed to A. Then if the pifton B is elevated by depreffing the extremity N of the lever, the water at A will be raifed higher in the barrel, and iffue at the fpout P, and when the fame pifton B is depreffed by elevating the end N of the lever, the pifton C is evidently raifed, and the water above it will be expelled at P. This pump, therefore, will give a continued ftream, for as the piftons afcend and defcend alternately, one of them muft always be forcing the water out at P. The piftons are elevated and depreffed by means of toothed arches, *c* and *d*, working in the teeth of a rack, at the extremities *a*, *b* of the pifton rod.

Buchanan's pump. Fig. 7.

317. The pump invented by Mr Buchanan is fhewn in fig. 7. In the vertical fection DGA, A is the fuction barrel, D the working barrel, E the pifton, G the fpout, B the inner valve, and C the outer valve. Thefe valves are of the kind called clack valves, and have their hinges generally of metal. It is eafily feen that when the pifton E is raifed, the water will rife through the fuction barrel A, into the working barrel D, in the fame way as in the fucking pump; and that when the pifton E is depreffed, it will force the water between it and the valve B, through the valve C, and make it iffue at G. The points of difference between this pump and thofe of the common form, are,—that it difcharges the water below the pifton, and has its valves lying near each other. Hence the fand or mud which may be in the water, is difcharged without injuring the barrel or the pifton leathers; and as the valves B, C may be of any fize, they will tranfmit, without being choked, any rubbifh which may rife in the fuction barrels. If any obftruction fhould happen to the valves, they are within the reach of the workman's hand, and may be cleared without taking the pump to pieces. This fimple machine may be quickly converted into a fire engine, by adding the air-veffel H, which is fcrewed like a hofepipe, and by fixing in the fpout G a perforated ftopple fitted to receive fuch pipes as are employed in fire engines. When thefe additions are made, the water, as in the cafe of the forcing pump, will be driven into the air veffel H, and repelled through the perforated ftopple G, by the elafticity of the included air.

Balance-pump. Figs. 8, & 9.

318. A fimple method of working two pumps at once by means of a balance, is exhibited in fig. 8. where AB is the balance, having a large iron ball at each end, placed in equilibrium on the two fpindles C, fee fig. 9. The perfon who works the pump ftands on two boards I, I, nailed to two crofs pieces faftened to the axis of the machine, and fupports himfelf by a crofs bar D *d* joined to the two parts D, E. At the diftance of ten inches on each fide of the axis are fufpended the iron rods M, N, to which the piftons are attached. The workman, by bearing alternately on the right and left foot, puts the balance in motion. The piftons M, N are alternately elevated and depreffed, and the water raifed in the barrel of each, is driven into the pipe HH, in which it is elevated to a height proportional to the diameter of the valves, and the power of the balance. In order to make the ofcillations of the balance equal, and prevent it from acquiring too great a velocity, iron fprings F, G are fixed to the upright pofts, which limit the length of its ofcillations.

Chain-pump. Plate CCLXXIII. Fig. 1.

319. The chain pump is reprefented in fig. 1. It confifts of a chain MTHG, about 30 feet long, carrying a number of flat piftons M, N, O, P, Q, which are made to revolve in the barrels ABCD and GH, by driving the wheel F. When the flat piftons are at the lower part of the barrel T, they are immerfed in the water RR, and as they rife in the barrel GH, they bring up the water along with them into the refervoir MG, from which it is conveyed by the fpout S. The teeth of the wheel F are fo contrived as to receive one-half of the flat piftons, and let them fold in; and fometimes another wheel like F is fixed at the bottom D. The diftance of the piftons from the fide of the barrel is about half an inch; but as the machine is generally worked with great velocity, the afcending piftons bring along with them into the refervoir as much water as fills the cavity GH. Sometimes chain pumps are conftructed without the barrels ABCD and GH. In this cafe, the flat piftons are converted into buckets connected with a chain, which dip in the water with their mouths downwards, and convey it to the refervoir. The buckets are moved by hexagonal axles, and the diftance between each is nearly equal to the depth of the buckets. Chain pumps are frequently in an inclined pofition, and in this pofition they raife the greateft quantity of water when the diftance of the flat piftons is equal to their breadth, and when the inclination of the barrels is about 24° 21′.

Hair-rope machine of the Sieur Vera. Fig. 1.

320. The hair-rope machine, invented by the Sieur Vera, operates on the fame principle as the chain pump. Inftead of a chain of piftons moving round the wheel F, a hair rope is fubftituted. The part of the rope at T that is loweft always dips in the water, which adhering to the rope is raifed along with it. When the rope reaches the top at G and M, it paffes through two fmall tubes, which being fixed in the bottom of the refervoir

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servoir prevent the water from returning into the well. Sometimes a common rope is employed, having a number of stuffed cushions fixed to it instead of the flat pistons in the chain pump. These cushions carry the water along with them through the barrel HG, and deliver it into the reservoir.—For the description of other pumps, see the article PUMP; and for pump mills, see the article MILL.

Machine with cushions instead of flat pistons.

SECT. II. *On Engines for Extinguishing Fire.*

Common squirting engine. Fig. 2.

321. THE common fire engine which discharges water in successive jets is represented in fig. 2. and is only a modification of the lifting pump. In the vessel AB full of water, is immersed the frame DC of a common lifting pump. This frame, and consequently the piston N, is elevated and depressed by means of the levers E, F, and the water which is raised is forced through the pipe G, which may be moved in any direction by means of the elastic leather pipe H, or by a ball and socket screwed on the top of the pump. While the piston N is descending, the stream at G is evidently discontinued, and issues only at each elevation of the piston. The vessel AB is supplied with water by buckets, and the pump is prevented from being choaked by the strainer LK which separates from the water any mud that it may happen to contain.

Improved fire-engine. Fig. 3.

322. As this fire engine does not afford a continued stream, it is not so useful in case of accidents as when the stream is uninterrupted. An improved engine of this sort is represented in fig. 3. where D, E, are two forcing pumps connected with the large vessel OG, and wrought by the levers F, G, moving upon H as a fulcrum. This apparatus is plunged and fastened in the vessel AB partly filled with water, and by means of the forcing pump DE, the operation of which has already been described, the water is driven through the valves I, L into the large vessel OG, where the included air is condensed. Into this vessel is inserted the tube PO communicating with the leathern pipe ORQS. The elasticity of the condensed air in the vessel OG pressing upon the surface of the water in that vessel, forces it up through the tube PO into the leathern pipe, from whose extremity S, it issues with great force and velocity; and as the condensed air is continually pressing upon the water in the vessel OG, the stream at S will be constant and uniform.

Newsham's fire-engine. Fig. 4.

323. A section of the fire engine, as improved by Mr Newsham, is represented in fig. 4. where TU and WX are the forcing pumps corresponding with D and C in fig. 3. YZ the large vessel corresponding with GO, and *ef* the tube corresponding with PO. The vessels TU, WX, YZ, the horizontal canals ON, QP, ML, and the vertical canal EE, all communicate with each other by means of four valves O, I, K, P opening upwards, and the vertical pipe is immersed in the water to be raised. When the piston R is raised by means of the double lever $\alpha\beta$, a vacuum would be made in the barrel TU, if the water at R were prevented from rising; but as this barrel communicates with the vessel of water below EF, on the surface of which the pressure of the atmosphere is exerted, the water will rise through EF, force open the valve H, and follow the piston R. By depressing the piston R, however, the water is driven down the barrel, closes the valve H, and rushes through the valve I into the air vessel YZ. The very same operation is going on with the pump WX, which forces the water into the air vessel through the valve K. By these means the air vessel is constantly filling with water, and the included air undergoing continual condensation. The air thus compressed, reacts upon the surface YZ of the water, and forces it through the tube *ef* to the stop-cock *eg*, whence, after turning the cock, the water passes into the tube *h*, fixed to a ball and socket, by which it may be discharged in any direction.

Reference to the improvements.

324. The fire engine has undergone various alterations and improvements from Bramah, Dickenson, Simpkin, Raventree, Philips and Furst, an account of whose engines may be seen in the Repertory of Arts, &c. A very simple and cheap fire engine has been invented by Mr B. Dearborn, and is described in the American Transactions for 1794, and in Gregory's Mechanics, vol. ii. p. 177.

SECT. III. *On Whitehurst's Machine, and Montgolfier's Hydraulic Ram.*

The idea of raising water by its own momentum first suggested by Mr Whitehurst.

325. MR Whitehurst * was the first who suggested the ingenious idea of raising water by means of its momentum. A machine upon the same principle as Mr Whitehurst's, but in an improved form, has lately made its appearance in France, and excited considerable attention both on the continent and in this country. Whatever credit, therefore, has been given to the inventor of the hydraulic ram, justly belongs to our countryman Mr Whitehurst, and Montgolfier is entitled to nothing more than the merit of an improver.

* *Phil. Trans.* 1775.

Description of Mr Whitehurst's machine. Plate CCLXXIV. Fig. 1.

326. Mr Whitehurst's machine, which was actually erected at Oulton in Cheshire, is represented in fig. 1. where AM is the original reservoir having its surface in the same horizontal line with the bottom of the reservoir BN. The diameter of the main pipe AE is one inch and a half, and its length about 200 yards; and the branch pipe EF is of such a size that the height of the surface M of the reservoir is nearly 16 feet above the cock F. In the valve box D is placed the valve *a*, and into the air vessel C are inserted the extremities *m*, *n* of the main pipe, bent downwards to prevent the air from being driven out, when the water is forced into it. Now as the cock F is 16 feet below the reservoir AM, the water will issue from F with a velocity of nearly 30 feet per second. As soon as the cock F therefore is opened, a column of water 200 yards long is put in motion, and though the aperture of the cock F be small, this column must have a very considerable momentum. Let the cock F be now suddenly stopped, and the water will rush through the valve *a* into the air vessel C, and condense the included air. This condensation must take place every time the cock is shut, and the imprisoned air being in a state of high compression, will react upon the water in the air vessel, and raise it into the reservoir BN.

Description of Montgolfier's hydraulic ram. Fig. 2.

327. A section of the hydraulic ram of Montgolfier is exhibited in fig. 2. where R is the reservoir, RS the height of the fall, and ST the horizontal canal which conveys the water to the engine ABHTC. E and D are two valves, and FG a pipe reaching within a very little of the bottom CB. Let us now suppose that wa-

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ter is permitted to descend from the reservoir. It will evidently rush out at the aperture *m n* till its velocity is such as to force up the valve E. The water being thus suddenly checked, and unable to find a passage at *m n*, will rush forwards to H and raise the valve D. A portion of water being thus admitted into the vessel ABC, the impulse of the column of fluid is spent, the valves D and E fall, and the water issues at *m n* as before; when its motion is again checked, and the same operation repeated, which has now been described. Whenever, therefore, the valve E closes, a portion of water will force its way into the vessel ABC, and condense the air which it contains, for the included air has no communication with the atmosphere after the bottom of the pipe FG is beneath the surface of the injected water. This condensed air will consequently react upon the surface of the water, and raise it in the pipe FG to an altitude proportioned to the elasticity of the included air. The external appearance of this engine, drawn from one in the possession of Professor Leslie, is represented in fig. 3. where ABC is the air vessel, F the valve box, G the extremity of the valve, and M, N screws for fixing the horizontal canal to the machine. When the engine is employed to form a jet of water, a piece of brass, A, with a small aperture, is screwed upon the top of the tube FG, which, in that case, rises no higher than the top of the air vessel. From this description it will be seen, that the only difference between the engines of Montgolfier and Whitehurst is, that the one requires a person to turn the cock, while the other has the advantage of acting spontaneously. Montgolfier (G) assures us, that the honour of this invention does not belong to England, but that he is the sole inventor, and did not receive a hint from any person whatever. We leave the reader to determine the degree of credit to which these assertions are entitled.—It would appear from some experiments made by Montgolfier, that the effect of the water ram is equal to between a half and three fourths of the power expended, which renders it superior to most hydraulic machines. *Appendix to Ferguson's Lectures*, p. 19.

Fig. 3.

Sect. IV. *On Archimedes's Screw Engine.*

Description of Archimedes's screw-engine.

Fig. 4.

328. The screw engine invented by Archimedes is represented in fig. 4. where AB is a cylinder with a flexible pipe, CEHOGF, wrapped round its circumference like a screw. The cylinder is inclined to the horizon, and supported at one extremity by the bent pillar IR, while its other extremity, furnished with a pivot, is immersed in the water. When, by means of the handle K, the cylinder is made to revolve upon its axis, the water which enters the lower orifice of the flexible pipe is raised to the top, and discharged at D. On some occasions, when the water to be raised moves with a considerable velocity, the engine is put in motion by a number of floatboards fixed at L, and impelled by the current; and if the water is to be raised to a great height, another cylinder is immersed in the vessel D, which receives the water from the first cylinder, and is driven by a pinion fixed at I. In this way, by having a succession of screw engines, and a succession of reservoirs, water may be raised to any altitude. An engine of this kind is described in Ferguson's Lectures, vol. ii. p. 113.

Operation of the screw-engine.

Fig. 5.

329. In order to explain the reason why the water rises in the spiral tube, let AB be a section of the engine, BC *d* DE the spiral tube, BF a horizontal line or the surface of the stagnant water which is to be raised, and ABF the angle which the axis of the cylinder makes with the horizon. Then, the water which enters the extremity B of the spiral tube will descend to C, and remain there as long as the cylinder is at rest. But if a motion of rotation be communicated to the cylinder, so that the lowest part C of the spiral BCD move towards B, and the points *d*, D, E towards C, and become successively the lowest parts of the spiral, the water must occupy successively the points *d*, D, E, and therefore rise in the tube; or, which is the same thing, when the point C moves to *c*, the point *d* will be at C; and as the water at C cannot rise along with the point C to *c*, on account of the inclination of C *c* to the horizon, it must occupy the point *d* of the spiral, when C has moved to *c*; that is, the water has a tendency to occupy the lower parts of the spiral, and the rotatory motion withdraws this part of the spiral from the water, and causes it to ascend to the top of the tube. By wrapping a cord round a cylinder, and inclining it to the horizon, so that the angle ABC may be greater than the angle ABF, and then making it revolve upon its axis, the preceding remarks will be clearly illustrated.—If the direction of the spiral BC should be horizontal, that is, if it should coincide with the line BF, the water will have no tendency to move towards C, and therefore cannot be raised in the tube. For a similar reason, it will not rise when the point C is above the horizontal line BF. Consequently, in the construction of this engine, the angle ABC, which the spiral forms with the side of the cylinder, must always be greater than the angle ABF, at which the cylinder is inclined to the horizon. In practice, the angle of inclination ABF should generally be about 50°, and the angle ABC about 65°.

330. The theory of this engine is treated at great length by Hennert, in his *Dissertation sur la vis d'Archimede*, Berlin 1767; by Pitot, in the Memoirs of the French Academy, and by Euler in the *Nov. Comment. Petrop.* tom. v. An account of Pitot's investigations may be seen in Gregory's Mechanics, vol. ii. p. 348.

Sect. V. *On the Persian Wheel.*

Description of the Persian wheel.

Fig. 6.

331. The Persian wheel is an engine which raises water to a height equal to its diameter. It is shewn in fig. 6. where CDE is the wheel driven by the stream AB acting upon floatboards fixed on one side of its rim. A number of buckets, *a*, *a*, *a*, *a*, are disposed on the opposite side of the rim, and suspended by strong pins, *b*, *b*, *b*, *b*, &c. When the wheel is in motion, the descending buckets immerge into the stream, and ascend full

(G) *Cette invention n'est point originaire d'Angleterre, elle appartient toute entiere à la France. Je declare que j'en suis le seul inventeur, et que l'idée ne m'en a etè fournie par personne.* Journal des Mines, vol. xiii. n° 73.

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full of water till they reach the top K, where they ſtrike againſt the extremity n of the fixed reſervoir M, and being overſet, diſcharge their contents into that reſervoir. As ſoon as the bucket quits the reſervoir, it reſumes its perpendicular poſition by its own weight, and deſcends as before. On each bucket is fixed a ſpring r, which moves over the top of the bar m, faſtened to the reſervoir. By this means the bottom of the bucket is raiſed above the level of its mouth, and its contents completely diſcharged.

332. On ſome occaſions, the Perſian wheel is made to raiſe water only to the height of its axle. In this caſe, inſtead of buckets, its ſpokes c, d, e, f, g, h, are made of a ſpiral form, and hollow within, ſo that their inner extremities all terminate in the box N on the axle, and their outer extremities in the circumference of the wheel. When the rim CDEF, therefore, is immerſed in the ſtream, the water runs into the tubes C, D, E, F, &c. riſes in the ſpiral ſpokes c, d, &c. and is diſcharged from the orifices at O into the reſervoir Q, from which it may be conveyed in pipes.

SECT. VI. *On the Zurich Machine.*

333. THIS machine is a kind of pump invented and erected by H. Andreas Wirtz, an ingenious tin-plate worker in Zurich, and operates on a principle different from all other hydraulic engines. The following deſcription of it, written by Dr Robiſon, is transferred to this part of the work for the ſake of uniformity.

Laſt plate of the article WATER-*Works*, fig. 16.

334. Fig. 16. is a ſketch of the ſection of the machine, as it was firſt erected by Wirtz at a dye-houſe in Limmat, in the ſuburbs or vicinity of Zurich. It conſiſts of a hollow cylinder, like a very large grindſtone, turning on a horizontal axis, and partly plunged in a ciſtern of water. The axis is hollow at one end, and communicates with a perpendicular pipe CBZ, part of which is hid by the cylinder. This cylinder or drum is formed into a ſpiral canal by a plate coiled up within it like the main ſpring of a watch in its box; only the ſpires are at a diſtance from each other, ſo as to form a conduit for the water of uniform width. This ſpiral partition is well joined to the two ends of the cylinder, and no water eſcapes between them. The outermoſt turn of the ſpiral begins to widen about three-fourths of a circumference from the end, and this gradual enlargement continues from Q to S nearly a ſemicircle: this part may be called the HORN. It then widens ſuddenly, forming a SCOOP or ſhovel SS′. The cylinder is ſupported ſo as to dip ſeveral inches into the water, whoſe ſurface is repreſented by VV′.

335. When this cylinder is turned round its axis in the direction ABEO, as expreſſed by the two darts, the ſcoop SS′ dips at V′, and takes up a certain quantity of water before it immerges again at V. This quantity is ſufficient to fill the taper part SQ, which we have called the HORN; and this is nearly equal in capacity to the outermoſt uniform ſpiral round.

336. After the ſcoop has emerged, the water paſſes along the ſpiral by the motion of it round the axis, and drives the air before it into the riſing-pipe, where it eſcapes.—In the mean time, air comes in at the mouth of the ſcoop; and when the ſcoop again dips into the water, it again takes in ſome. Thus there is now a part filled with water and a part filled with air. Continuing this motion, we ſhall receive a ſecond round of water and another of air. The water in any turn of the ſpiral will have its two ends on a level; and the air between the ſucceſſive columns of water will be in its natural ſtate; for ſince the paſſage into the riſing pipe or MAIN is open, there is nothing to force the water and air into any other poſition. But ſince the ſpires gradually diminiſh in their length, it is plain that the column of water will gradually occupy more and more of the circumference of each. At laſt it will occupy a complete turn of ſome ſpiral that is near the centre; and when ſent farther in, by the continuance of the motion, ſome of it will run back over the top of the ſucceeding ſpiral. Thus it will run over at K 4 into the right-hand ſide of the third ſpiral. Therefore it will puſh the water of this ſpire backwards, and raiſe its other end, ſo that it alſo will run over backwards *before* the next turn be completed. And this change of diſpoſition will at laſt reach the firſt or outermoſt ſpiral, and ſome water will run over into the horn and ſcoop, and finally into the ciſtern.

337. But as ſoon as water gets into the riſing pipe, and riſes a little in it, it ſtops the eſcape of the air when the next ſcoop of water is taken in. Here are now two columns of water acting againſt each other by hydroſtatic preſſure and the intervening column of air. They muſt compreſs the air between them, and the water and air-columns will now be unequal. This will have a general tendency to keep the whole water back, and cauſe it to be higher on the left or riſing ſide of each ſpire than on the right deſcending ſide. The exceſs of height will be juſt ſuch as produces the compreſſion of the air between that and the preceding column of water. This will go on increaſing as the water mounts in the riſing-pipe; for the air next to the riſing pipe is compreſſed at its inner end with the weight of the whole column in the main. It muſt be as much compreſſed at its outer end. This muſt be done by the water column without it; and this column exerts this preſſure partly by reaſon that *its* outer end is higher than its inner end, and partly by the tranſmiſſion of the preſſure on its outer end by air, which is ſimilarly compreſſed from without. And thus it will happen that each column of water, being higher at its outer than at its inner end, compreſſes the air on the water column beyond or within it, which tranſmits this preſſure to the air beyond it, adding to it the preſſure ariſing from its own want of level at the ends. Therefore the greateſt compreſſion, viz. that of the air next the main, is produced by *the ſum of all the tranſmitted preſſures;* and theſe are the ſum of all the differences between the elevations of the inner ends of the water columns above their outer ends: and the height to which the water will riſe in the main will be juſt equal to this ſum.

338. Draw the horizontal lines K′K 1, K′K 2, K′K 3, &c. and mn, mn, mn, &c. Suppoſe the left-hand ſpaces to be filled with water, and the right-hand ſpaces to be filled with air. There is a certain gradation of compreſſion which will keep things in this poſition. The ſpaces evidently decreaſe in arithmetical progreſſion; ſo do the hydroſtatic heights and preſſures of the water columns. If therefore the air be denſe in the ſame progreſſion, all will be in hydroſtatical equilibrium.

Now

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Plate CCLXXIV. Fig. 7.

Now this is evidently producible by the mere motion of the machine; for fince the denfity and compreffion in each air column is fuppofed inverfely as the bulk of the column, the abfolute quantity of air is the fame in all; therefore the column firft taken in will pafs gradually inwards, and the increafing compreffion will caufe it to occupy precifely the whole right-hand fide of every fpire. The gradual diminution of the water columns will be produced during the motion by the water running over backwards at the top, from fpire to fpire, and at laft coming out by the fcoop.

339. It is evident that this difpofition of the air and water will raife the water to the greateft height, becaufe the hydroftatic height of each water column is the greateft poffible, viz. the diameter of the fpire. This difpofition may be obtained in the following manner: Take CL to CB as the denfity of the external air to its denfity in the laft column next the rifing-pipe or main; that is, make CL to CB as 33 feet (the height of the column of water which balances the atmofphere), to the fum of 33 feet and the height of the rifing-pipe. Then divide BL into fuch a number of turns, that the fum of their diameters fhall be equal to the height of the main; then bring a pipe ftraight from L to the centre C. The reafon of all this is very evident.

340. But when the main is very high, this conftruction will require a very great diameter of the drum, or many turns of a very narrow pipe. In fuch cafes it will be much better to make the fpiral in the form of a cork-fcrew, as in fig. 1. inftead of this flat form like a watch fpring. The pipe which forms the fpiral may be lapped round the fruftum of a cone, whofe greateft diameter is to the leaft (which is next to the rifing pipe) in the fame proportion that we affigned to CB and CL. By this conftruction the water will ftand in every round fo as to have its upper and lower furfaces tangents to the top and bottom of the fpiral, and the water columns will occupy the whole afcending fide of the machine, while the air occupies the defcending fide.

Plate CCLXXV. Fig. 1.

341. This form is vaftly preferable to the flat: it will allow us to employ many turns of a large pipe, and therefore produce a great elevation of a large quantity of water.

The fame thing will be ftill better done by lapping the pipe on a cylinder, and making it taper to the end, in fuch a proportion that the contents of each round may be the fame as when it is lapped round the cone. It will raife the water to a greater height (but with an increafe of the impelling power) by the fame number of turns, becaufe the vertical or preffing height of each column is greater.

Nay, the fame thing may be done in a more fimple manner, by lapping a pipe of uniform bore round a cylinder. But this will require more turns, becaufe the water columns will have lefs differences between the heights of their two ends. It requires a very minute inveftigation to fhow the progrefs of the columns of air and water in this conftruction, and the various changes of their arrangement, before one is attained which will continue during the working of the machine.

342. We have chofen for the defcription of the machine that conftruction which made its principle and manner of working moft evident, namely, which contained the fame material quantity of air in each turn of the fpiral, more and more compreffed as it approaches to the rifing pipe. We fhould otherwife have been obliged to inveftigate in great detail the gradual progrefs of the water, and the frequent changes of its arrangement, before we could fee that one arrangement would be produced which would remain conftant during the working of the machine. But this is not the beft conftruction. We fee that, in order to raife water to the height of a column of 34 feet, which balances the atmofphere, the air in the laft fpire is compreffed into half its bulk; and the quantity of water delivered into the main at each turn is but half of what was received into the firft fpire, the reft flowing back from fpire to fpire, and being difcharged at the fpout.

343. But it may be conftructed fo as that the quantity of water in each fpire may be the fame that was received into the firft; by which means a greater quantity (double in the inftance now given) will be delivered into the main, and raifed to the fame height by very nearly the fame force.—This may be done by another proportion of the capacity of the fpires, whether by a change of their caliber or of their diameters. Suppofe the bore to be the fame, the diameter muft be made fuch that the conftant column of water, and the column of air, compreffed to the proper degree, may occupy the whole circumference. Let A be the column of water which balances the atmofphere, and h the height to which the water is to be raifed. Let A be to $A+h$ as 1 to m.

344. It is plain that m will reprefent the denfity of the air in the laft fpire, if its natural denfity be 1, becaufe it is preffed by the column $A+h$, while the common air is preffed by A. Let 1 reprefent the conftant water column, and therefore nearly equal to the air column in the firft fpire. The whole circumference of the laft fpire muft be $1+\frac{1}{m}$, in order to hold the water 1, and the air compreffed into the fpace $\frac{1}{m}$ or $\frac{A}{A+h}$.

345. The circumference of the firft fpire is $1+1$ or 2. Let D and d be the diameters of the firft and laft fpires; we have $2 : 1+\frac{1}{m} = D : d$, or $2m : m+1 = D : d$. Therefore if a pipe of uniform bore be lapped round a cone, of which D and d are the end diameters, the fpirals will be very nearly fuch as will anfwer the purpofe. It will not be quite exact, for the intermediate fpirals will be fomewhat too large. The conoidal fruftum fhould be formed by the revolution of a curve of the logarithmic kind. But the error is very trifling.

With fuch a fpiral, the full quantity of water which was confined in the firft fpiral will find room in the laft, and will be fent into the main at every turn. This is a very great advantage, efpecially when the water is to be much raifed. The faving of power by this change of conftruction is always in proportion to the greateft compreffion of the air.

The great difficulty in the conftruction of any of

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of these forms is in determining the form and position of the horn and the scoop; and on this greatly depends the performance of the machine. The following instructions will make it pretty easy.

Plate CCLXXV. Fig. 2.

346. Let ABEO (fig. 2.) represent the first or outermost round of the spiral, of which the axis is C. Suppose it immerged up to the axis in the water VV, we have seen that the machine is most effective when the surfaces KB and O *n* of the water columns are distant the whole diameter BO of the spiral. Therefore let the pipe be first supposed of equal caliber to the very mouth E *e*, which we suppose to be just about to dip into the water. The surface O *n* is kept there, in opposition to the pressure of the water column BAO, by the compressed air contained in the quadrant OE, and in the quadrant which lies behind EB. And this compression is supported by the columns behind, between this spire and the rising pipe. But the air in the outermost quadrant EB is in its natural state, communicating as yet with the external air. When, however, the mouth E *e* has come round to A, it will not have the water standing in it in the same manner, leaving the half space BEO filled with compressed air; for it took in and confined only what filled the quadrant BE. It is plain, therefore, that the quadrant BE must be so shaped as to take in and confine a much greater quantity of air; so that when it has come to A, the space BEO may contain air sufficiently dense to support the column AO. But this is not enough: For when the wide mouth, now at A *α*, rises up to the top, the surface of the water in it rises also, because the part AO *o a* is more capacious than the cylindric part OE*eo* which succeeds it, and which cannot contain all the water that it does. Since, then, the water in the spire rises above A, it will press the water back from O *n* to some other position *m' n'*, and the pressing height of the water-column will be diminished by this rising on the other side of O. In short, the horn must begin to widen, not from B, but from A, and must occupy the whole semicircle ABE; and its capacity must be to the capacity of the opposite cylindrical side as the sum of BO, and the height of a column of water which balances the atmosphere to the height of that column. For then the air which filled it, when of the common density, will fill the uniform side BEO, when compressed so as to balance the vertical column BO. But even this is not enough; for it has not taken in enough of water. When it dipped into the cistern at E, it carried air down with it, and the pressure of the water in the cistern caused the water to rise into it a little way; and some water must have come over at B from the other side, which was drawing narrower. Therefore when the horn is in the position EOA, it is not full of water. Therefore when it comes into the situation OAB, it cannot be full nor balance the air on the opposite side. Some will therefore come out at O, and and rise up through the water. The horn must therefore, 1st, Extend at least from O to B, or occupy half the circumference; and, 2dly, It must contain at least twice as much water as would fill the side BEO. It will do little harm though it be much larger; because the surplus of air which it takes in at E will be discharged, as the end E *e* of the horn rises from O to B, and it will leave the precise quantity that is wanted. The overplus water will be discharged as the horn comes round to dip again into the cistern. It is possible, but requires a discussion too intricate for this place, to make it of such a size and shape, that while the mouth moves from E to B, passing through O and A, the surface of the water in it shall advance from E *ε* to O *n*, and be exactly at O when the beginning or narrow end of the horn arrives there.

347. We must also secure the proper quantity of water. When the machine is so much immersed as to be up to the axis in water, the capacity which thus secures the proper quantity of air will also take in the proper quantity of water. But it may be erected so as that the spirals shall not even reach the water. In this case it will answer our purpose if we join to the end of the horn a scoop or shovel QRSB (fig. 3.), which is so formed as to take in at least as much water as will fill the horn. This is all that is wanted in the beginning of the motion along the spiral, and more than is necessary when the water has advanced to the succeeding spire; but the overplus is discharged in the way we have mentioned. At the same time, it is needless to load the machine with more water than is necessary, merely to throw it out again. We think that if the horn occupies fully more than one-half of the circumference, and contains as much as will fill the whole round, and if the scoop lifts as much as will certainly fill the horn, it will do very well.

Plate CCLXXV. Fig. 3.

N. B. The scoop must be very open on the side next the axis, that it may not confine the air as soon as it enters the water. This would hinder it from receiving water enough.

348. The following dimensions of a machine erected at Florence, and whose performance corresponded extremely well with the theory, may serve as an example.

The spiral is formed on a cylinder of 10 feet diameter, and the diameter of the pipe is six inches. The smaller end of the horn is of the same diameter; it occupies three-fourths of the circumference, and is $7\frac{8}{10}$ths inches wide at the outer end. Here it joins the scoop, which lifts as much water as fills the horn, which contains 4340 Swedish cubic inches, each $= 1.577$ English. The machine makes six turns in a minute, and raises 1354 pounds of water, or 22 cubic feet, 10 feet high in a minute.

349. The above account will, we hope, sufficiently explain the manner in which this singular hydraulic machine produces its effect. When every thing is executed by the maxims which we have deduced from its principles, we are confident that its performance will correspond to the theory; and we have the Florentine machine as a proof of this. It raises more than ten-elevenths of what the theory promises, and it is not perfect. The spiral is of equal caliber, and is formed on a cylinder. The friction is so inconsiderable in this machine, that it need not be minded: but the great excellency is, that whatever imperfection there may be in the arrangement of the air and water columns, this only affects the elegance of the execution, causing the water to make a few more turns in the spiral before it can mount to the height required; but wastes no power, because the power employed is always in proportion to the sum of the vertical columns of water in the rising side of the machine; and the height to which the water is raised by it is in the very same proportion. It should be

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be made to move very flow, that the water be not always dragged up by the pipes, which would caufe more to run over from each column, and diminifh the preffure of the remainder.

350. If the rifing-pipe be made wide, and thus room be made for the air to efcape freely up through the water, it will rife to the height affigned; but if it be narrow, fo that the air cannot get up, it rifes almoft as flow as the water, and by this circumftance the water is raifed to a much greater height mixed with air, and this with hardly any more power. It is in this way that we can account for the great performance of the Florentine machine, which is almoft triple of what a man can do with the fineft pump that ever was made: indeed the performance is fo great, that one is apt to fufpect fome inaccuracy in the accounts. The entry into the rifing-pipe fhould be no wider than the laft part of the fpiral; and it would be advifable to divide it into four channels by a thin partition, and then to make the rifing-pipe very wide, and to put into it a number of flender rods, which would divide it into flender channels that would completely entangle the air among the water. This will greatly increafe the height of the heterogeneous column. It is furprifing that a machine that is fo very promifing fhould have attracted fo little notice. We do not know of any being erected out of Switzerland, except at Florence in 1778. The account of its performance was in confequence of a very public trial in 1779, and honourable declaration of its merit, by Sig. Lorenzo Ginori, who erected another, which fully equalled it. It is fhortly mentioned by Profeffor Sulzer of Berlin, in the *Sammlungen Vermifchlen Schriften* for 1754. A defcription of it is publifhed by the Philofophical Society at Zurich in 1766, and in the defcriptions publifhed by the Society in London for the encouragement of Arts in 1776. The celebrated Daniel Bernouilli has publifhed a very accurate theory of it in the Peterfburgh Commentaries for 1772, and the machines at Florence were erected according to his inftructions. Baron Alftromer in Sweden caufed a glafs model of it to be made, to exhibit the internal motions for the inftruction of artifts, and alfo ordered an operative engine to be erected; but we have not feen any account of its performance. It is a very intricate machine in its principles; and an ignorant engineer, nay the moft intelligent, may erect one which fhall hardly do any thing; and yet, by a very trifling change, may become very powerful. We prefume that failures of this kind have turned the attention of engineers from it; but we are perfuaded that it may be made very effective, and we are certain that it muft be very durable.

Plate CCLXXV. Fig. 4.

Fig. 4. is a fection of the manner in which the author has formed the communication between the fpiral and the rifing-pipe. P is the end of the hollow axis which is united with the folid iron axis. Adjoining to P, on the under fide, is the entry from the laft turn of the fpiral. At Q is the collar which refts on the fupports, and turns round in a hole of bell-metal. *ff* is a broad flanch caft in one piece with the hollow part. Beyond this the pipe is turned fomewhat fmaller, very round and fmooth, fo as to fit into the mouth of the rifing-pipe, like the key of a cock. This mouth has a plate *e e* attached to it. There is another plate *d d*, which is broader than *e e*, and is not fixed to the cylindrical part, but moves eafily round it. In this plate are four fcrews, fuch as *g*, *g*, which go into holes in the plate *ff*, and thus draw the two plates *ff* and *d d* together, with the plate *e e* between them. Pieces of thin leather are put on each fide of *e e*; and thus all efcape of water is effectually prevented, with a very moderate compreffion and friction.

Water Blowing Machine.

Chap. IV. *On Machines in which Water is the chief Agent.*

Sect. I. *On the Water Blowing Machine.*

Defcription of the water-blowing machine.

Plate CCLXXV. Fig. 5.

351. The water blowing machine confifts of a refervoir of water AB, into the bottom of which the bent leaden pipe BCH is inferted; of a condenfing veffel DE, into whofe top the lower extremity H of the pipe is fixed, and of a pedeftal P refting on the bottom of this veffel. When the water from the refervoir AB is defcending through the part CH of the pipe, it is in contact with the external air by means of the orifices or tubes *m*, *n*, *o*, *p*; and by the principle of the lateral communication of motion in fluids (art. 160.), the air is dragged along with the water. This combination of air and water iffuing from the aperture H, and impinging upon the furface of the ftone pedeftal P, is difperfed in various directions. The air being thus feparated from the water, afcends into the upper part of the veffel, and rufhes through the opening F, whence it is conveyed by the pipe FG to the fire at G, while the water falls to the lower part of the veffel, and is difcharged by the openings M, N.—That the greateft quantity of air may be driven into the veffel DE, the water fhould begin to fall at C with the leaft poffible velocity; and the height of the loweft tubes above the extremity H of the pipe fhould be three-elevenths of the length of the vertical tube CH, in order that the air may move in the pipe FG with fufficient velocity.

Way in which the wind is generated.

352. Fabri and Dietrich imagined that the wind is produced by the decompofition of the water, or its transformation into gas, in confequence of the agitation and percuffion of its parts. But M. Venturi, to whom we owe the firft philofophical account of this machine, has fhewn that this opinion is erroneous, and that the wind is fupplied from the atmofphere, for no wind was generated when the lateral openings *m*, *n*, *o*, *p* were fhut. The principal object, therefore, in the conftruction of water blowing machines, is to combine as much air as poffible with the defcending current. For this purpofe the water is often made to pafs through a kind of cullender placed in the open air, and perforated with a number of fmall triangular orifices. Through thefe apertures the water defcends in many fmall ftreams; and by expofing a greater furface to the atmofphere, it carries along with it an immenfe quantity of air. The water is then conveyed to the pedeftal P by a pipe CH opened and enlarged at C, fo as to be confiderably wider than the end of the tube which holds the cullender.

353. It has been generally fuppofed that the waterfall fhould be very high; but Dr. Lewis has fhewn, by a variety of experiments, that a fall of four or five feet is fufficient, and that when the height is greater than this, two or more blowing machines may be erected, by conducting the water from which the air is extricated, into another refervoir, from which it again defcends, and generates

Bramah's Press.

generates air as formerly. In order that the air which is neceſſarily loaded with moiſture, may arrive at the furnace in as dry a ſtate as poſſible, the condenſing veſſel DE ſhould be made as high as circumſtances will permit; and in order to determine the ſtrength of the blaſt, it ſhould be furniſhed with a gage $a\,b$ filled with water.

Cauſes of the rain wind.

354. The rain wind is produced in the ſame way as the blaſt of air in water blowing machines. When the drops of rain impinge upon the ſurface of the ſea, the air which they drag along with them often produces a heavy ſquall, which is ſufficiently ſtrong to carry away the maſt of a ſhip. The ſame phenomenon happens at land, when the clouds empty themſelves in alternate ſhowers. In this caſe, the wind proceeds from that quarter of the horizon where the ſhower is falling. The common method of accounting for the origin of the winds by local rarefaction of the air appears pregnant with inſuperable difficulties; and there is reaſon to think that theſe agitations in our atmoſphere ought rather to be referred to the principle which we have now been conſidering. For farther information on this ſubject, the reader is referred to Lewis's Commerce of Arts, Wolfii *Opera Mathematica*, tom. i. p. 830. *Journal des Mines*, N° xci. or Nicholſon's Journal, vol. xii. p. 48.

Sect. II. *Bramah's Hydroſtatic Preſs.*

Deſcription of Bramah's machine.

Plate CCLXXV. Fig. 6.

355. The machine invented by Mr Bramah of Piccadilly, depends upon the principle, that any preſſure exerted upon a fluid maſs is propagated equally in every direction (art. 111.) It is repreſented in fig. 6. where A is a ſtrong metallic cylinder, furniſhed with a piſton B perfectly water-tight. Into the bottom of this cylinder is inſerted the end of the bent tube C, the interior orifice of which is cloſed by the valve D. The other extremity of the tube communicates with the forcing pump E, by which water or other fluids may be driven into the cylinder A. Then, if any preſſure is exerted on the ſurface of the water in the cylinder E by means of the lever H, this preſſure will be propagated to the cylinder A, and exert a certain force upon the piſton B, varying with the reſpective areas of the ſections of each cylinder. If the diameter of the cylinder E is equal to the diameter of the cylinder A, and if a force of 10 pounds is exerted at the handle H, then the piſton B will be elevated with a force of 10 pounds; if the diameter of E be one-half that of A, the piſton B will be raiſed with a force of 40 pounds, becauſe the area of the one piſton is four times the area of the other. Or, in general, if D be the diameter of the cylinder A, d that of the cylinder E, and F the force exerted at the lever H, we ſhall have $d^2 : D^2 = F : \frac{F \times D^2}{d^2}$, which is the force exerted upon the piſton B. Thus, if $d = 2$ inches, $D = 24$ inches, and $F = 10$ pounds, then $\frac{F \times D^2}{d^2} = \frac{10 \times 24 \times 24}{2 \times 2} = 1440$ pounds, the force with which the piſton B is elevated. Now, as this force increaſes as d^2 diminiſhes, or as F and D^2 increaſe, there is no limit to the power of the engine; for the diameter of the cylinder A may be made of any ſize, and that of the cylinder E exceedingly ſmall, while the power may be ſtill farther augmented by lengthening the lever H. The ſame effects may be produced by injecting air into the pipe C by means of a large globe fixed at its extremity. Upon the ſame principles the power and motion of one machine may be communicated to another; for we have only to connect the two machines by means of a pipe filled with water, inſerted at each extremity into a cylinder furniſhed with a piſton. By this means the power which depreſſes one of the piſtons will be transferred along the connecting pipe, and will elevate the other piſton. In the ſame way water may be raiſed out of wells of any depth, and at any diſtance from the place where the power is applied; but we muſt refer the reader, for a detailed account of theſe applications, to the ſpecification of the patent obtained by Mr Bramah, or to Gregory's Mechanics, vol. ii. p. 120.

Sect. III. *On Clepſydræ or Water-Clocks.*

Clepſydræ.

Hiſtory of clepſydræ.

356. A clepſydra or water-clock, derived from κλέπτω, "to ſteal," and ὕδωρ, "water," is a machine which meaſures time by the motion of water (art. 159.) The invention of this machine has been aſcribed to Scipio Naſica, the couſin of Scipio Africanus, who flouriſhed about 200 years before the Chriſtian era. It was well known, however, at an earlier period, among the Egyptians, who employed it to meaſure the courſe of the ſun. It is highly probable that Scipio Naſica had only the merit of introducing it into his native country. Theſe machines were in uſe for a very long period, and continued to be employed as meaſurers of time till the invention of the pendulum clock enriched the arts and ſciences.

The clepſydra of Cteſibius.

357. The clepſydra, invented by Cteſibius of Alexandria, was an intereſting machine. The water which indicated the progreſs of time by the gradual deſcent of its ſurface, flowed in the form of tears from the eyes of a human figure. Its head was bent down with age: Its look was dejected, while it ſeemed to pay the laſt tribute of regret to the fleeting moments as they paſſed. —The water which was thus diſcharged was collected in a vertical reſervoir, where it raiſed another figure holding in its hand a rod, which, by its gradual aſcent, pointed out the hours upon a vertical column. The ſame fluid was afterwards employed in the interior of the pedeſtal, as the impelling power of a piece of machinery which made this column revolve round its axis in a year, ſo that the months and the days were always ſhewn by this index, whoſe extremity deſcribed a vertical line divided according to the relative lengths of the hours of day and night. Among the ancients the length of the hours varied every day, and even the hours of the day differed in length from thoſe of the night; for the length of the day, or the interval between ſunriſe and ſunſet, was always divided into *twelve* equal parts, while the length of the night, or the interval between ſunſet and ſunriſe, was divided into the ſame number of parts, for hours. A farther deſcription of this beautiful machine, and others of the ſame nature, may be ſeen in Perrault's *Vitruvius*.

358. The method of conſtructing clepſydræ, when the veſſel from which the fluid iſſues is cylindrical or of any other form, has been ſhewn in Prop. VII. Part II. Inſtead of dividing the ſides of the veſſel, for a ſcale to aſcertain the deſcent of the fluid ſurface, the

Clepsydræ.

following method may be adopted. In the bottom of the cylindrical vessel ABCD, which is about 12 inches high, and four inches in diameter, is inserted a small glass adjutage E, which discharges the water in the vessel by successive drops. A hole F, about half an inch in diameter, is perforated in the cover AB, so as to allow the glass tube GI, about 16 inches long, and half an inch in diameter, to move up and down without experiencing any resistance. To the extremity of this tube is attached the ball I, which floats on the surface of the water in the vessel, and is kept steady, either by introducing a quantity of mercury into its cavity, if it be hollow, or by suspending a weight if it is a solid which does not sink in water. When the vessel is filled with water, the ball I will be at the top AB; then, in order to graduate the tube C, let the water flow out at E, and by means of a watch mark the points on the tube which descend to F after the lapse of every hour, every half hour, and every quarter, and the instrument will be finished. In order to use this hydroscope or water-clock, pour water into the vessel ABCD till the hour of the day is about to descend below F; and when this is done, it will point out any succeeding hour till the vessel is emptied.

Fig. 3.

Hamilton's clepsydra.

Fig. 7.

359. The clepsydra, invented by the honourable Mr Charles Hamilton, is represented in fig. 7. An open canal *e e*, supplied with a constant and equal stream by the syphon *d*, has at each end *f f*, open pipes *f* 1, *f* 2 of exactly equal bores, which deliver the water that runs along the canal *e*, alternately into the vessels *g* 1, *g* 2, in such a quantity as to raise the water from the mouth of the tantalus *t*, exactly in an hour. The canal *e e* is equally poised by the two pipes *f* 1, *f* 2, upon a centre *r*; the ends of the canal *e* are raised alternately, as the cups *z z* are depressed, to which they are connected by lines running over the pullies *l l*. The cups *z z* are fixed at each end of the balance *m m*, which moves up and down upon its centre *v*. *n* 1, *n* 2, are the edges of two wheels or pullies, moving different ways alternately, and fitted to the cylinder *o* by oblique teeth both in the cavity of the wheel and upon the cylinder, which, when the wheel *n* moves one way, that is, in the direction of the minute-hand, meet the teeth of the cylinder and carry the cylinder along with it, and slip over those of the cylinder when *n* moves the contrary way, the teeth not meeting, but receding from each other. One or other of these wheels *n n* continually moves *o* in the same direction, with an equable and uninterrupted motion. A fine chain goes twice round each wheel, having at one end a weight X, always out of the water, which equiponderates with *y* at the other end, when kept floating on the surface of the fluid in the vessel *g*, which *y* must always be; the two cups *z*, *z*, one at each end of the balance, keep it in equilibrio, till one of them is forced down by the weight and impulse of the water, which it receives from the tantalus *t t i*. Each of these cups *z*, *z*, has likewise a tantalus of its own *h*, *h*, which empties it after the water has run from *g*, and leaves the two cups again in equilibrio: *q* is a drain to carry off the water. The dial-plate, &c. needs no description. The motion of the clepsydra is effected thus: As the end of the canal *e e*, fixed to the pipe *f* 1, is the lowest in the figure, all the water supplied by the syphon runs through the pipe *f* 1, into the vessel *g* 1, till it runs over the top of the tantalus *t*; when it immediately runs out at *i* into the cup Z, at the end of the balance *m*, and forces it down; the balance moving on its centre *v*. When one side of *m* is brought down, the string which connects it to *f* 1, running over the pulley *l*, raises the end *f* 1, of the canal *e*, which turns upon its centre *r*, higher than *f* 2; consequently, all the water which runs through the syphon *d* passes through *f* 2 into *g* 2, till the same operation is performed in that vessel, and so on alternately. As the height to which the water rises in *g* in an hour, viz. from S to *t*, is equal to the circumference of *n*, the float *y* rising through that height along with the water, allows the weight X to act upon the pulley *n*, which carries with it the cylinder *o*; and this, making a revolution, causes the index *k* to describe an hour on the dial-plate. This revolution is performed by the pulley *n* 1; the next is performed by *n* 2, whilst *n* 1 goes back, as the water in *g* 1 runs out through the tantalus; for *y* must follow the water, as its weight increases, out of it. The axis *o* always keeps moving the same way; the index *p* describes the minutes; each tantalus must be wider than the syphon, that the vessels *g g* may be emptied as low as *s*, before the water returns to them.

360. For farther information respecting subjects connected with hydrodynamics, see the articles *Floating Bodies*, Mechanics, Mill, Pump, *Resistance of Fluids*, River, *Specific Gravity*, *Ship-Building*, and *Water Works*.

Erratum.—Page 784. col. 1. *Dele* the side note, and substitute in its place, Plate CCLXXIV. fig. 7.

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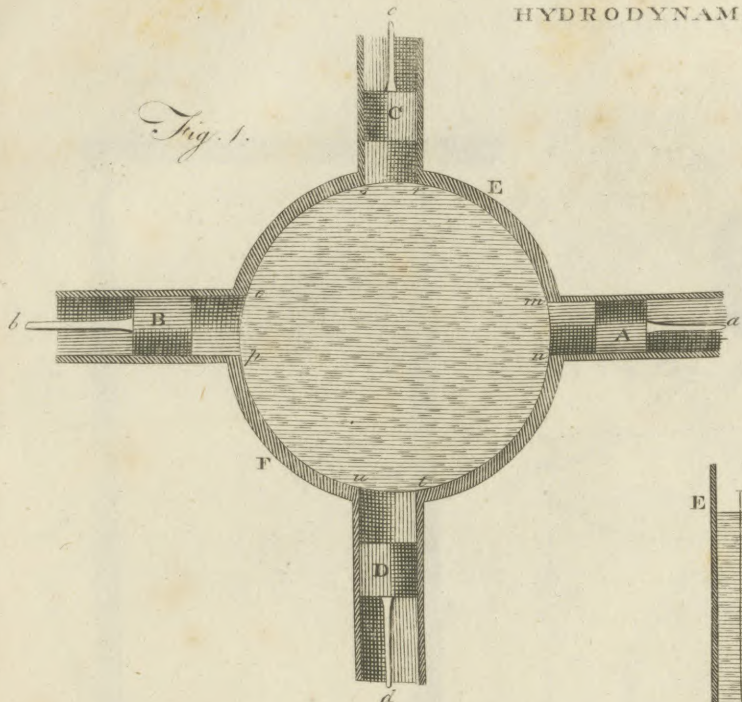

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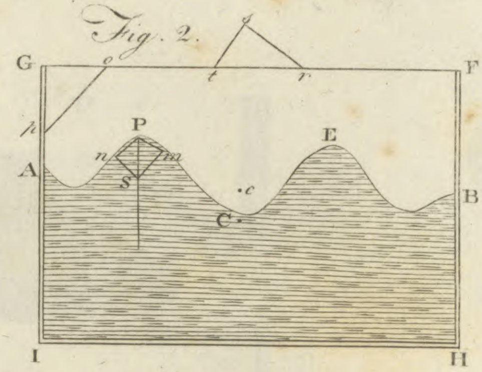

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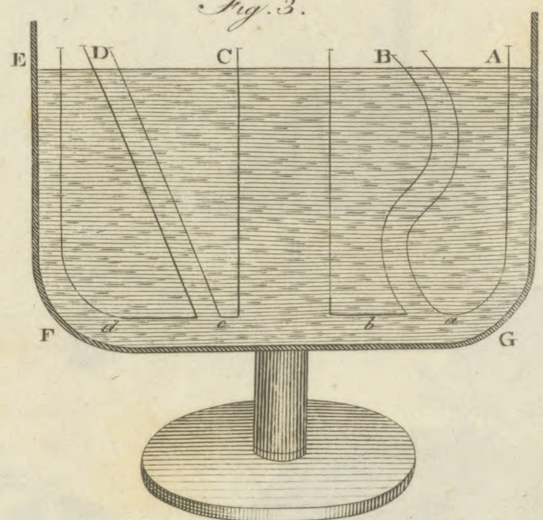

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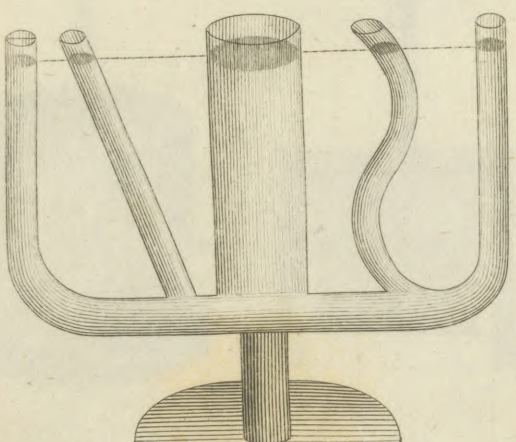

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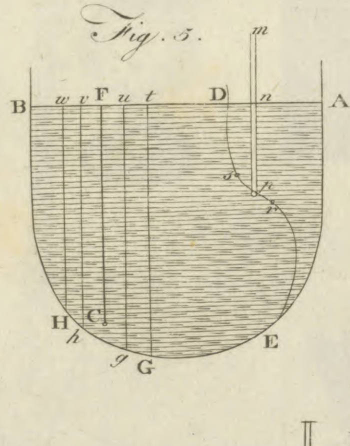

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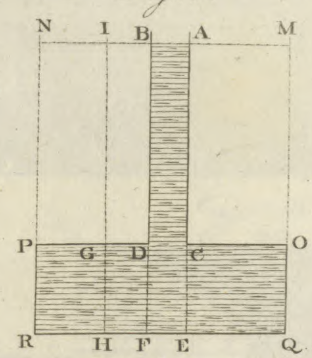

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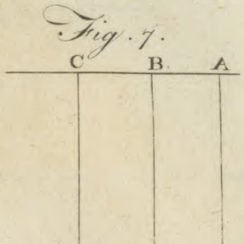

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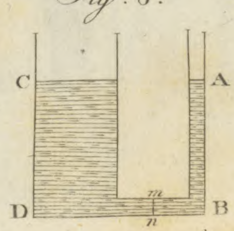

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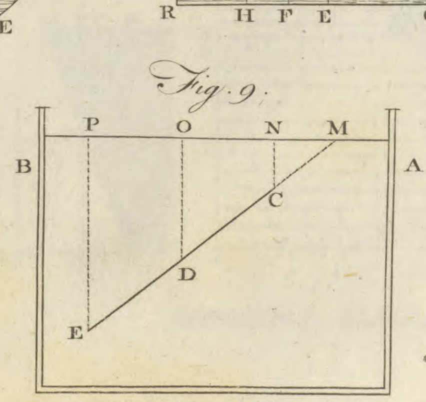

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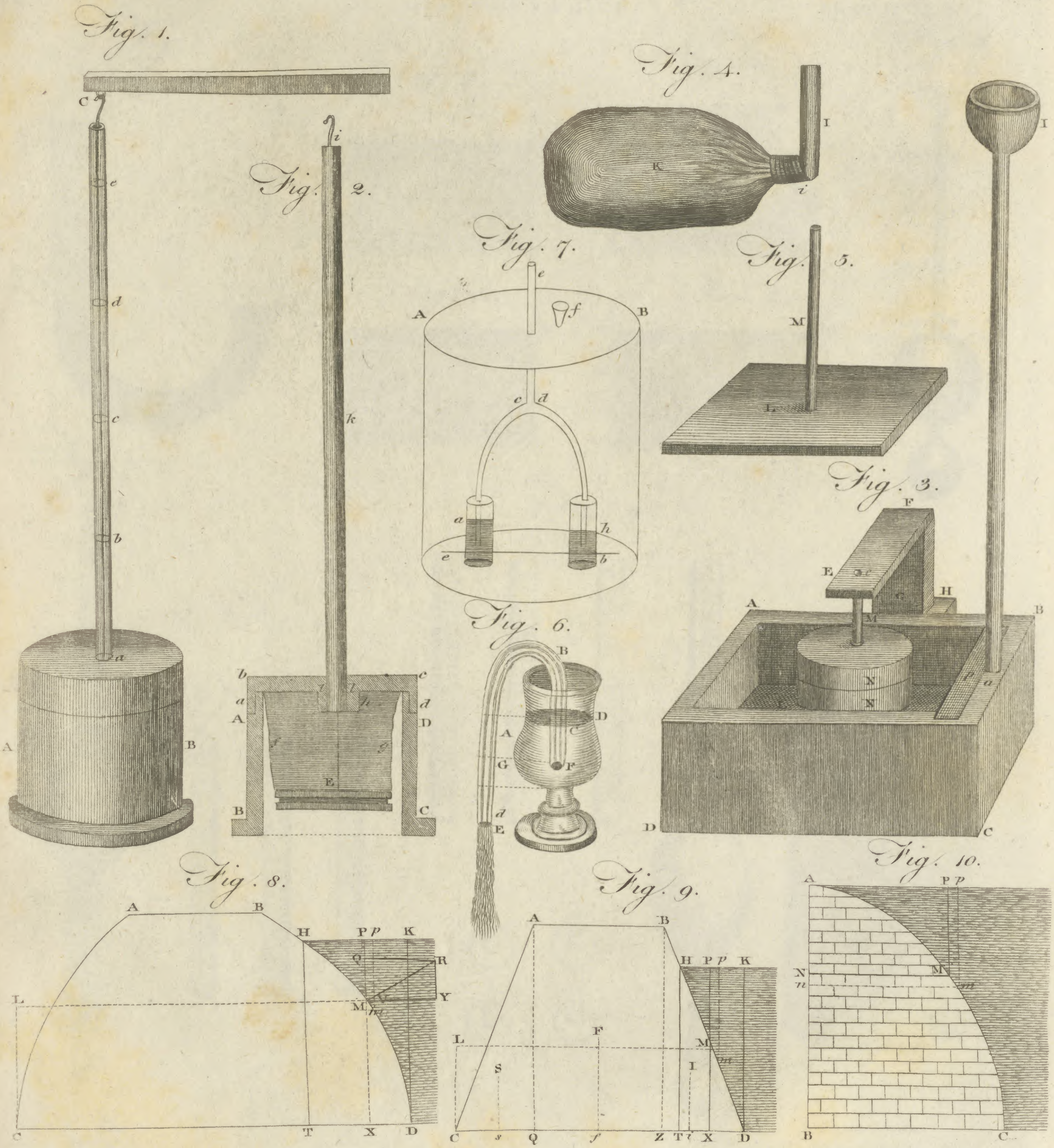

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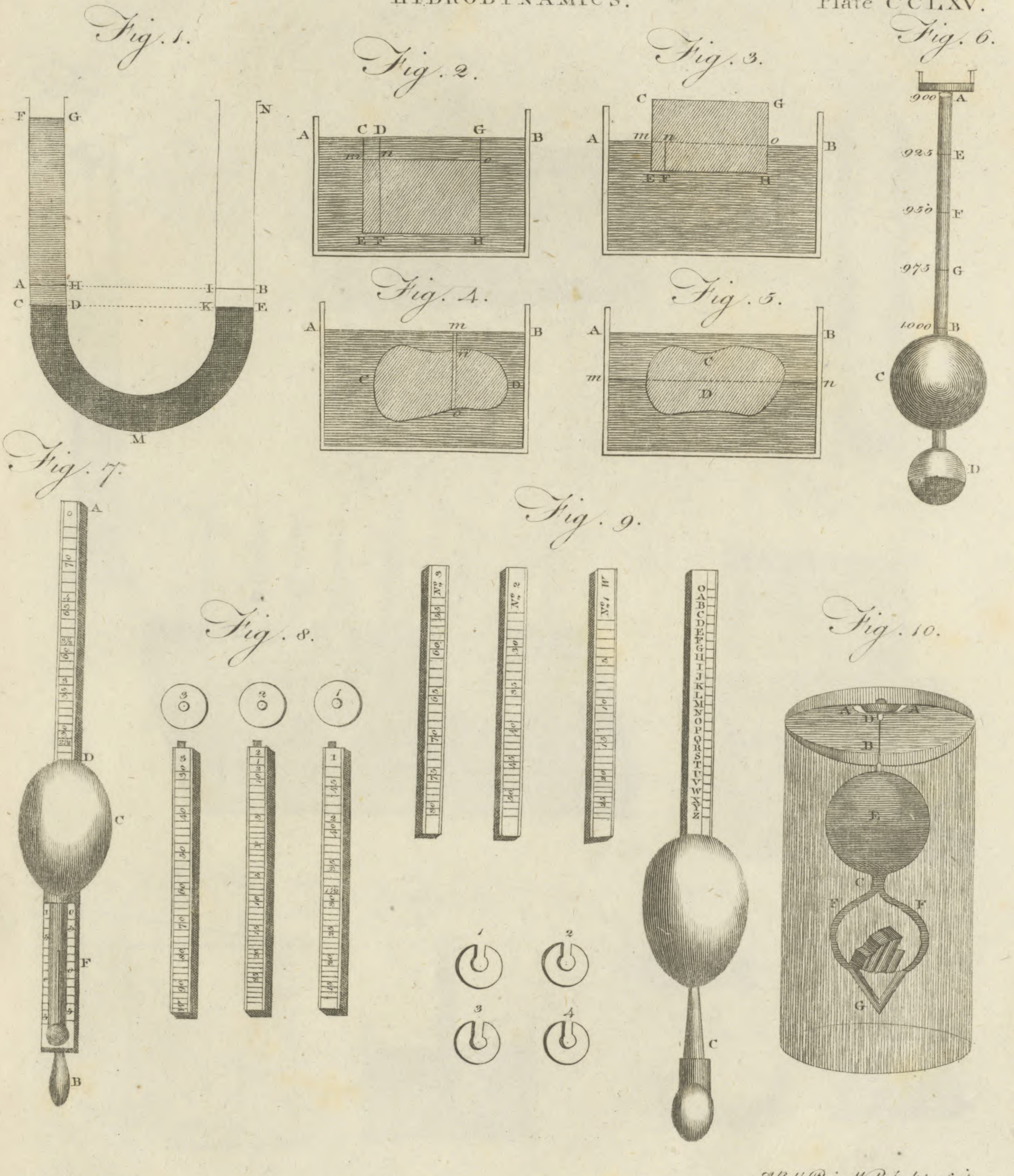

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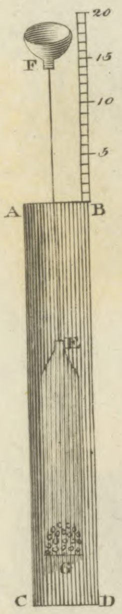

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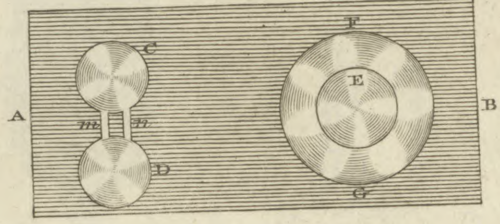

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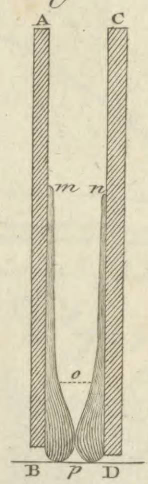

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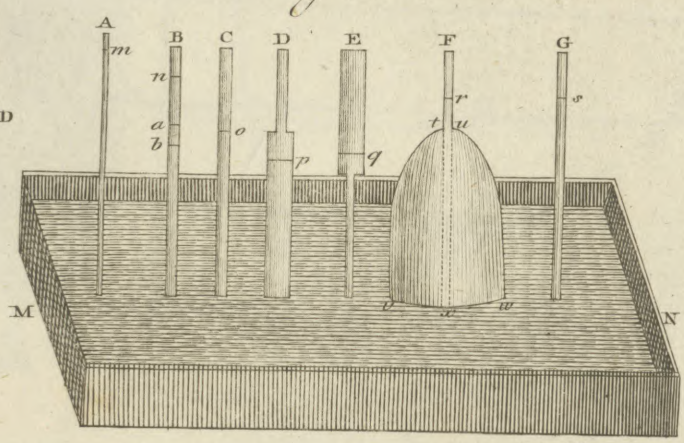

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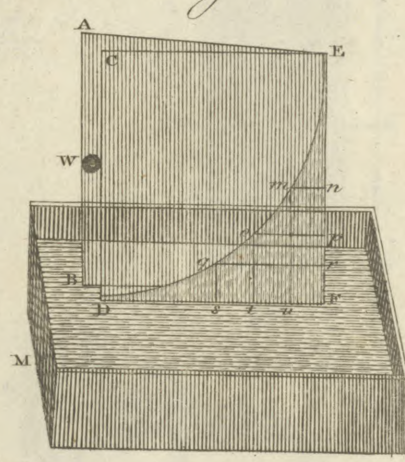

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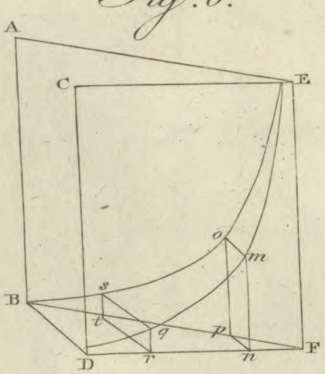

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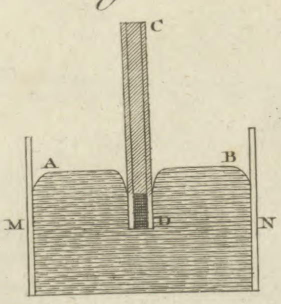

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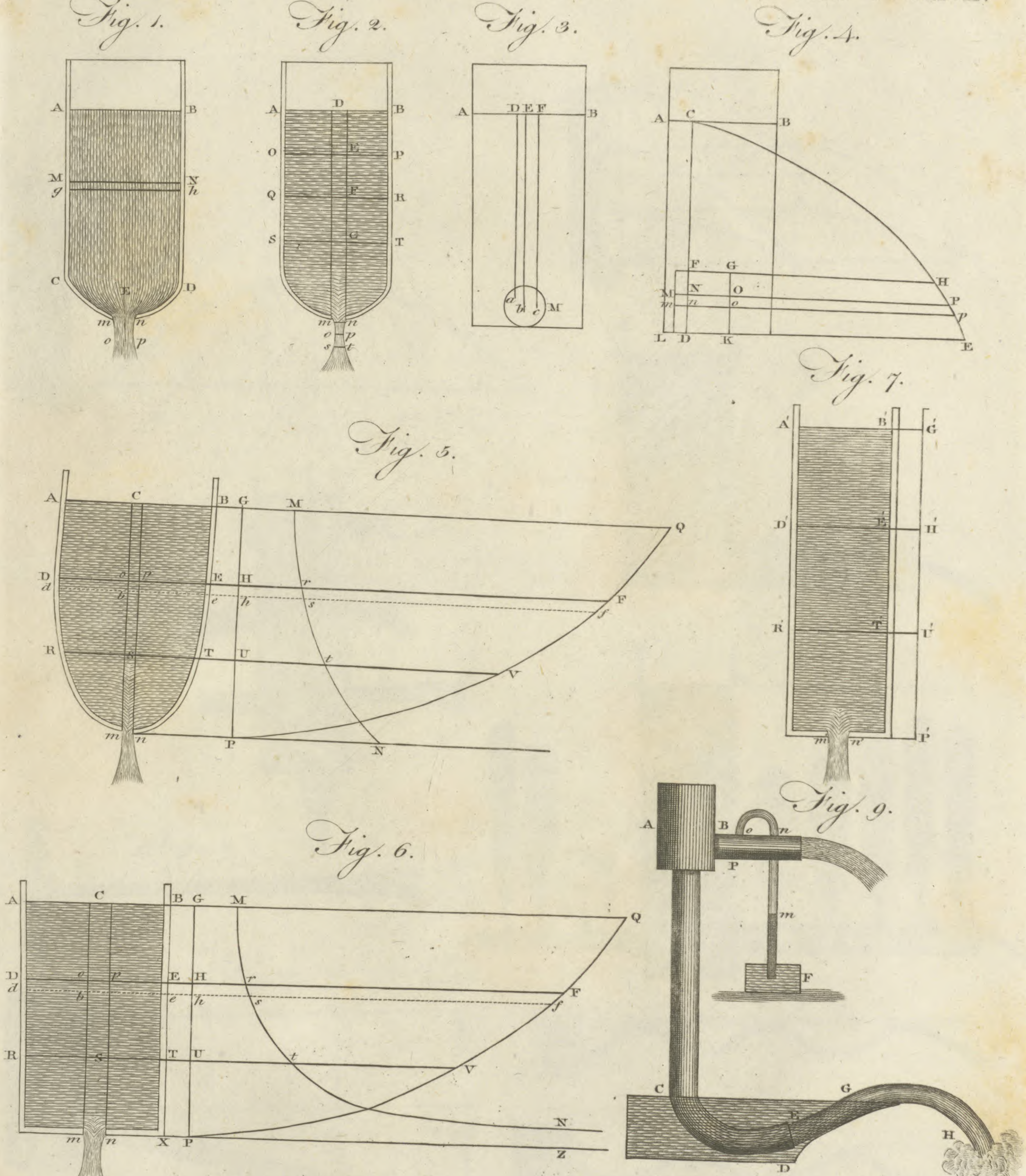

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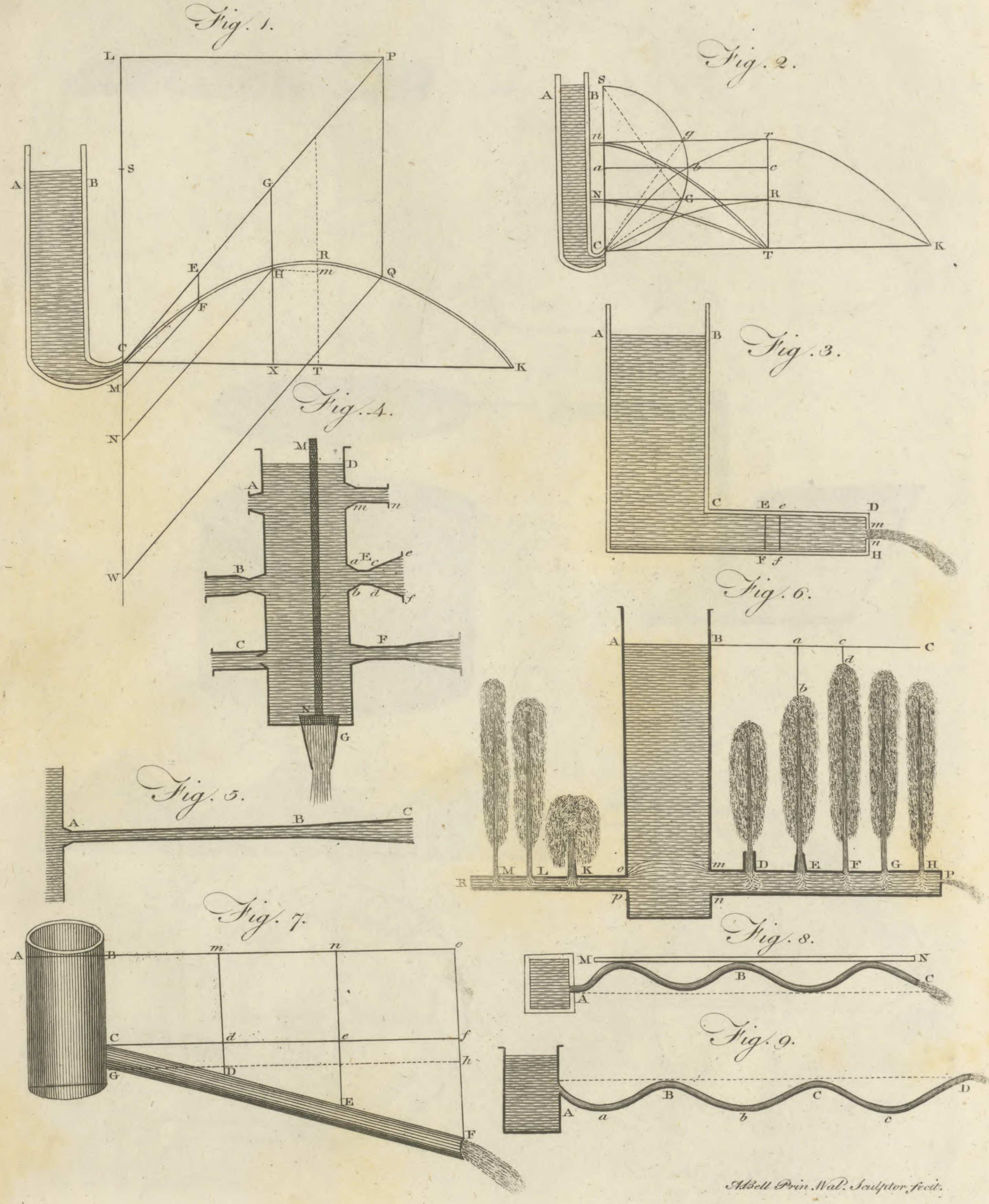

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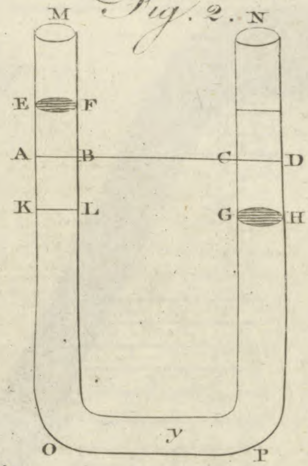

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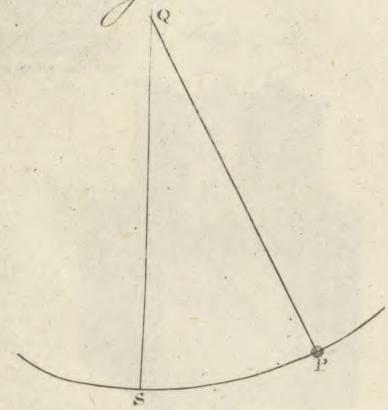

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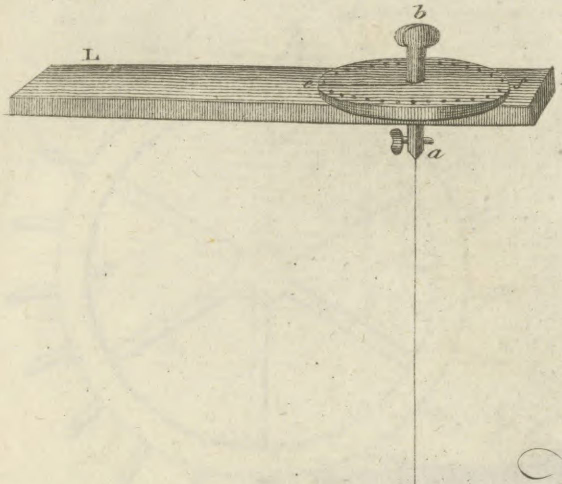
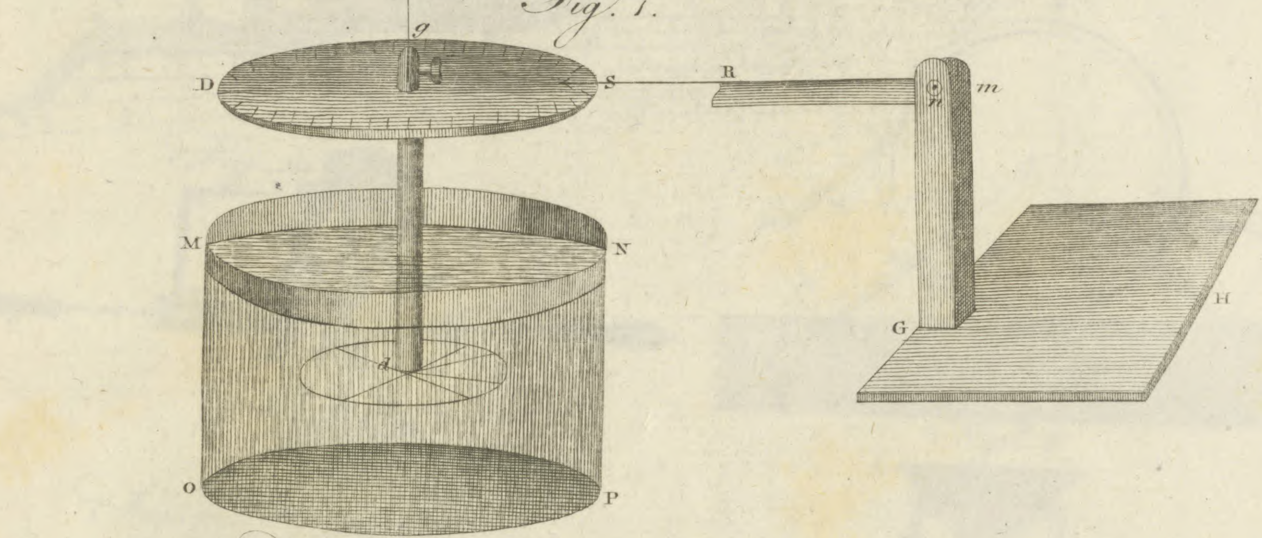

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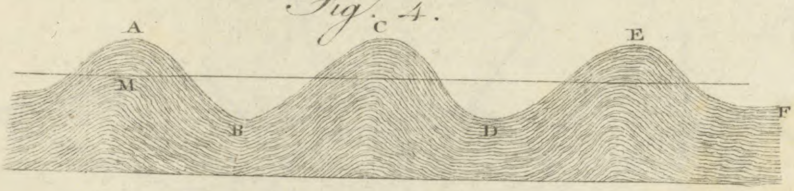

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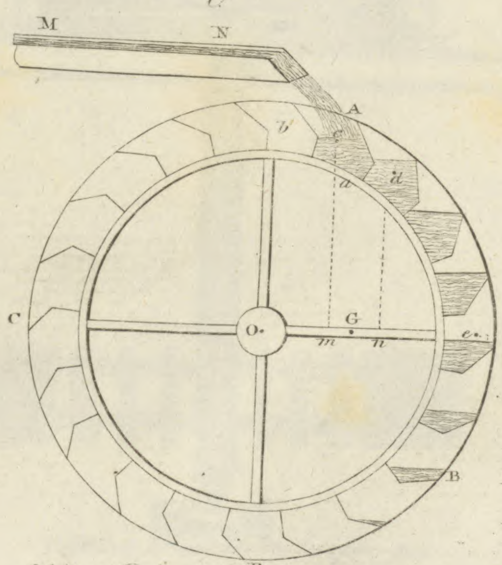

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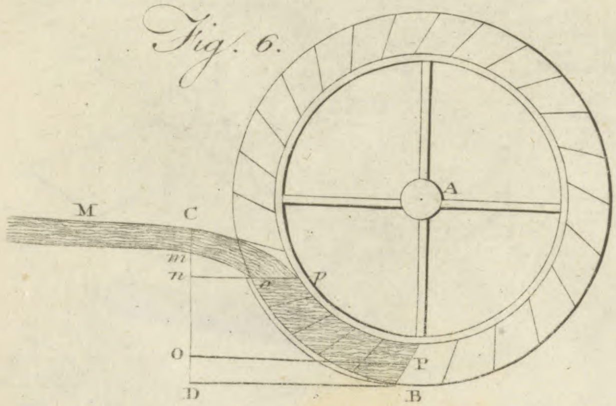

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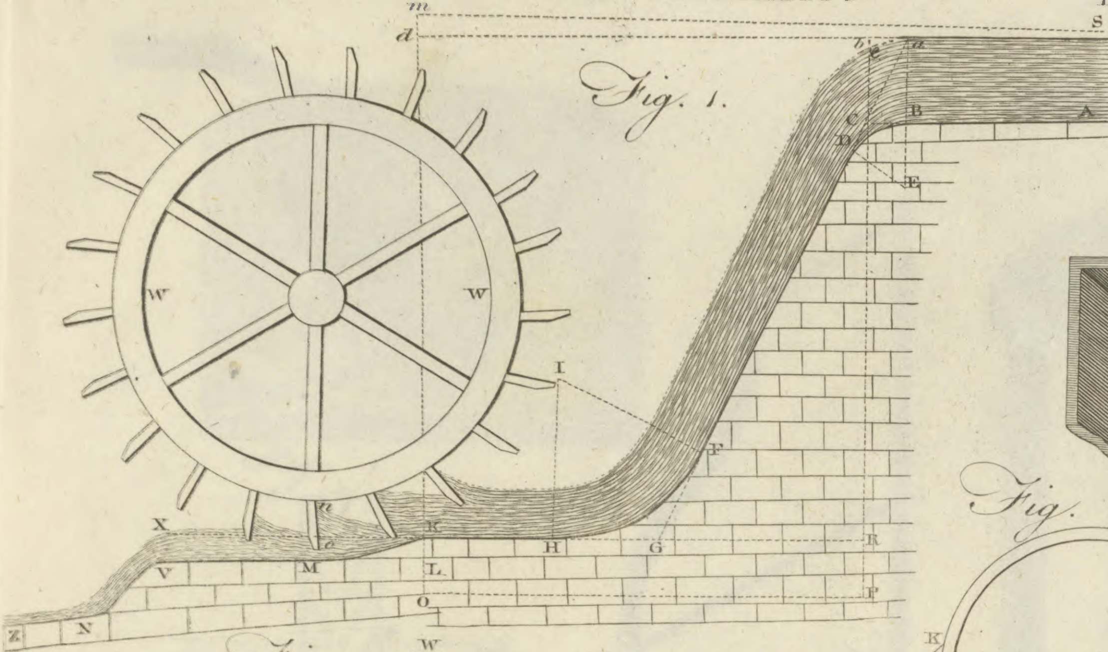

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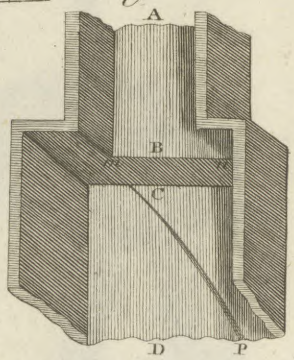

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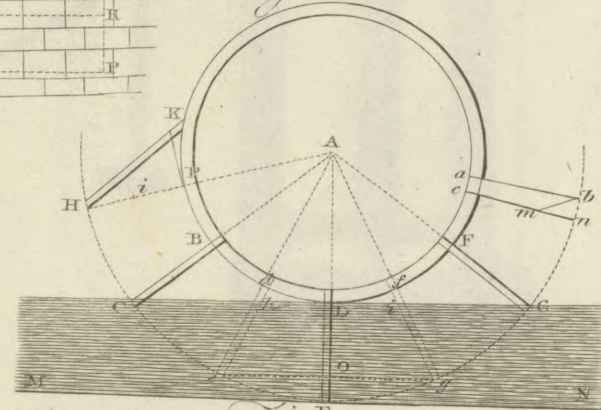

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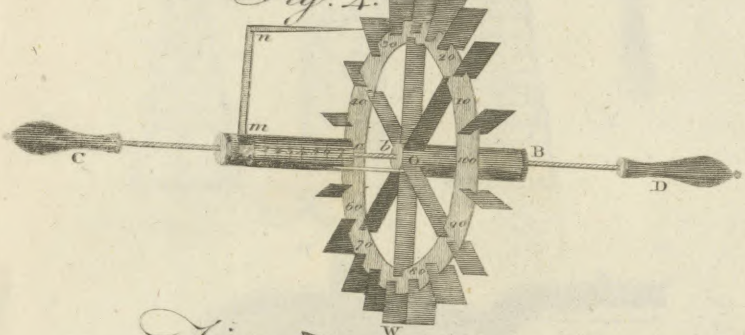

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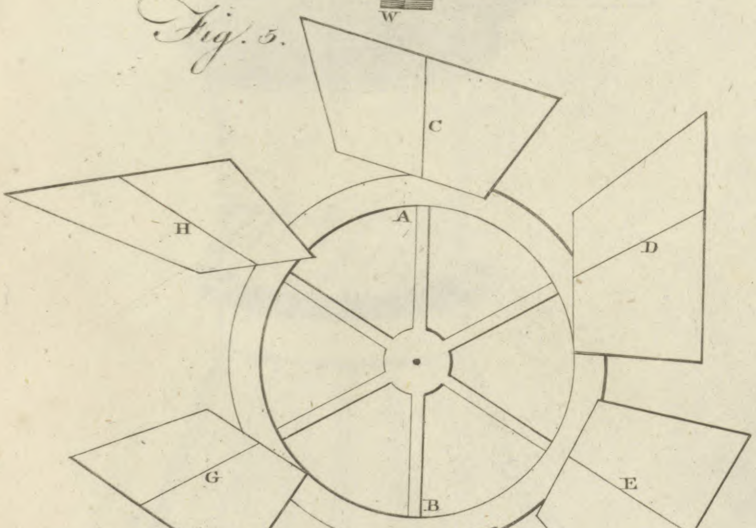

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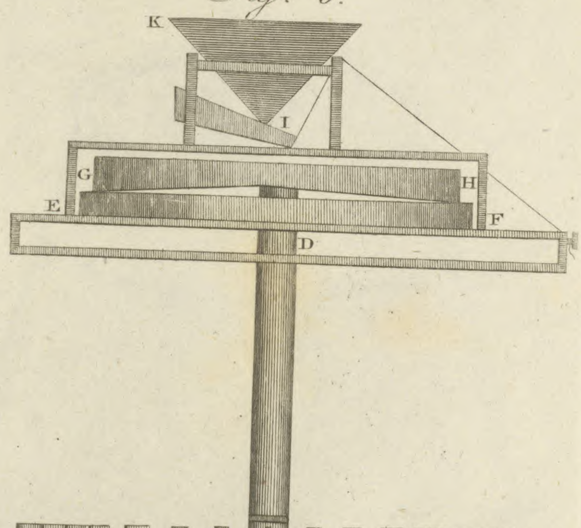

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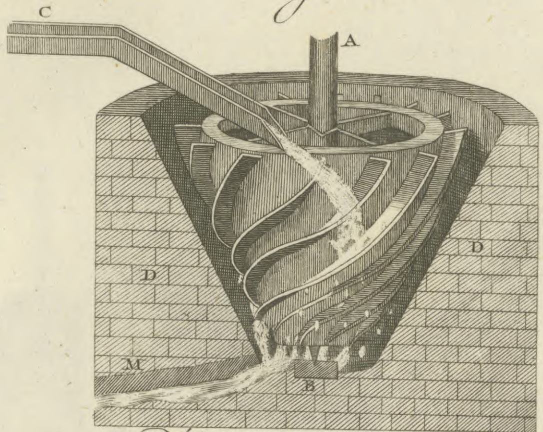
Fig. 2.



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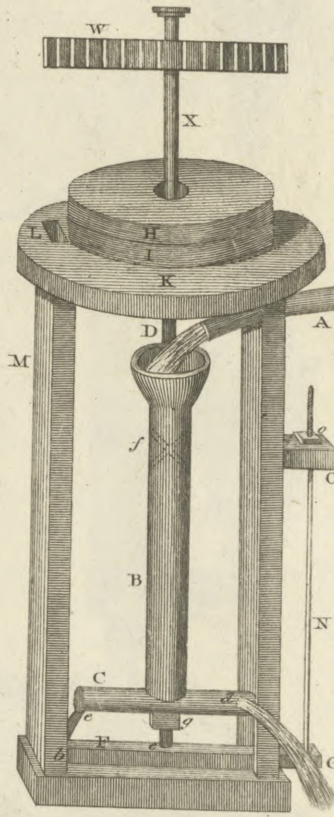

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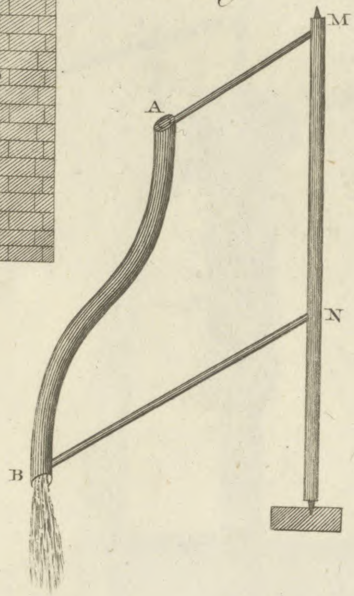

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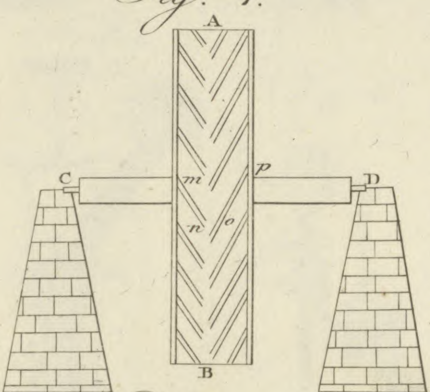

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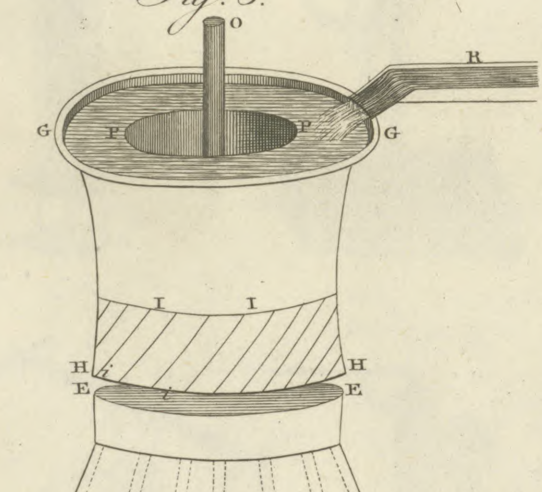

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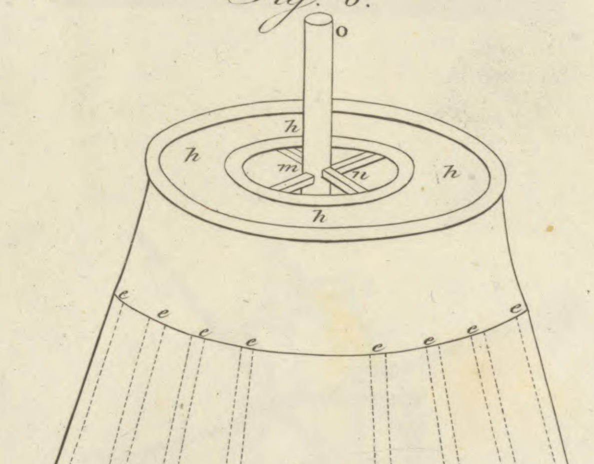

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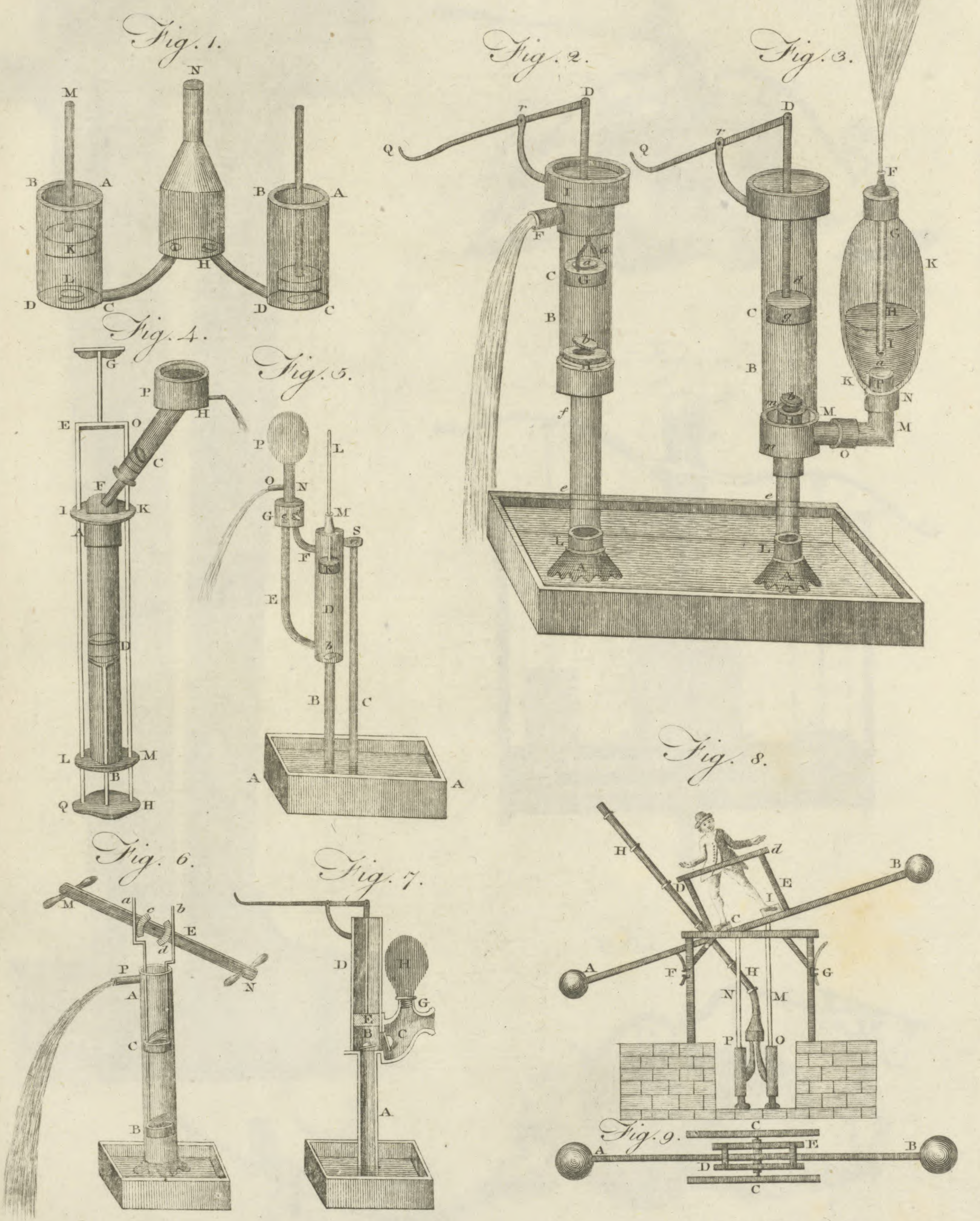

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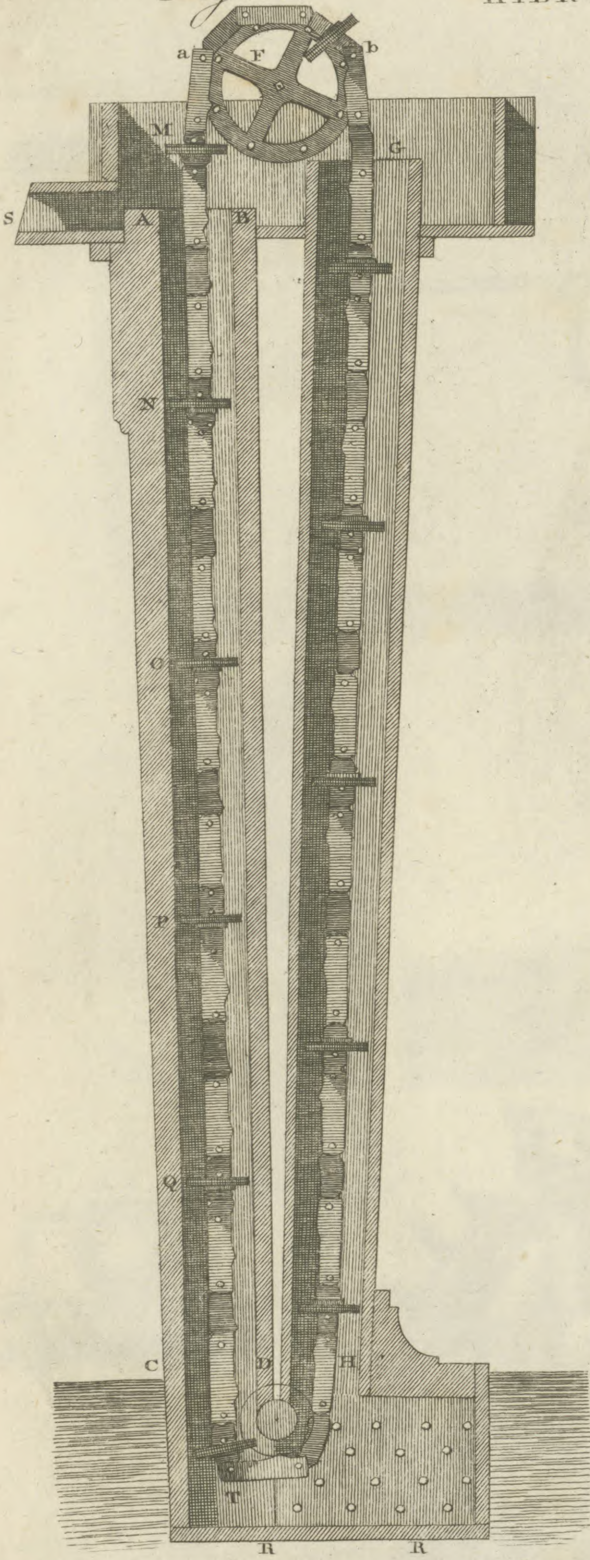
Fig. 1.



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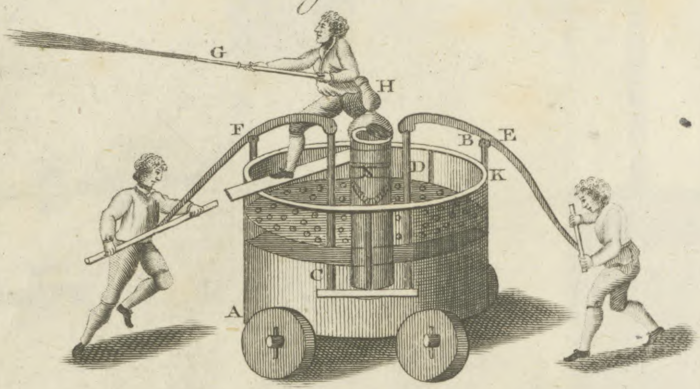

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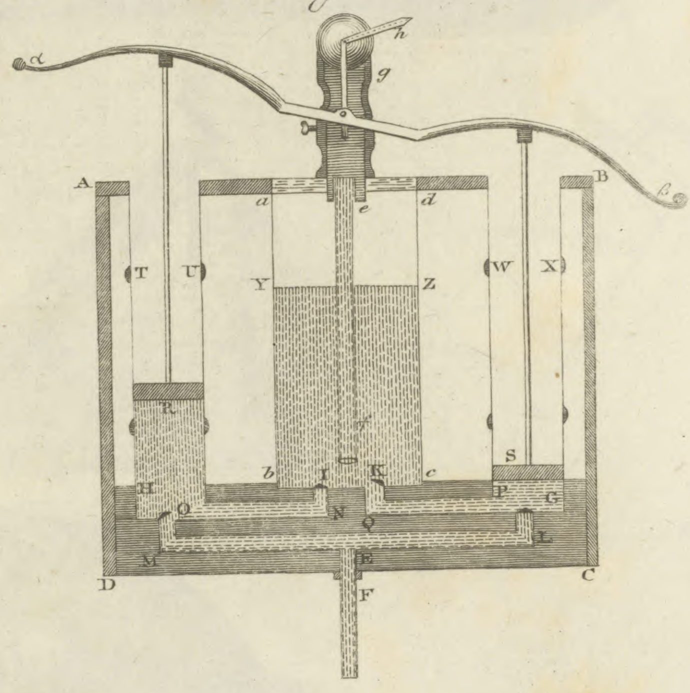

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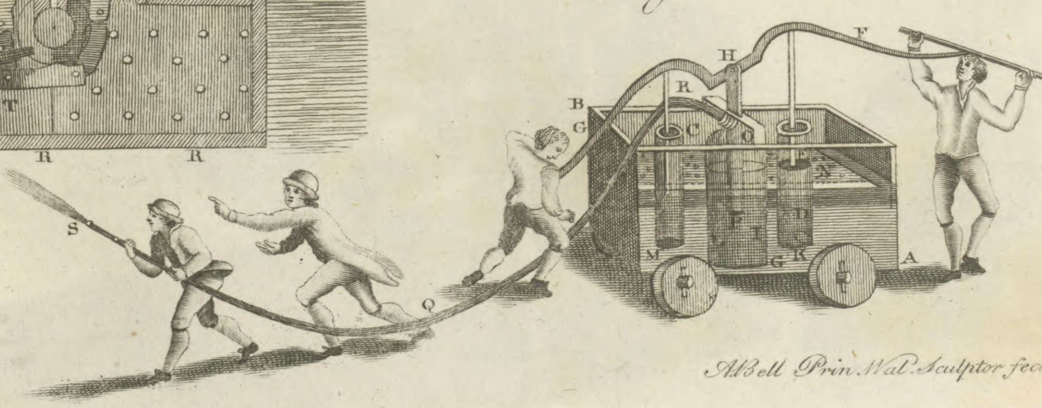

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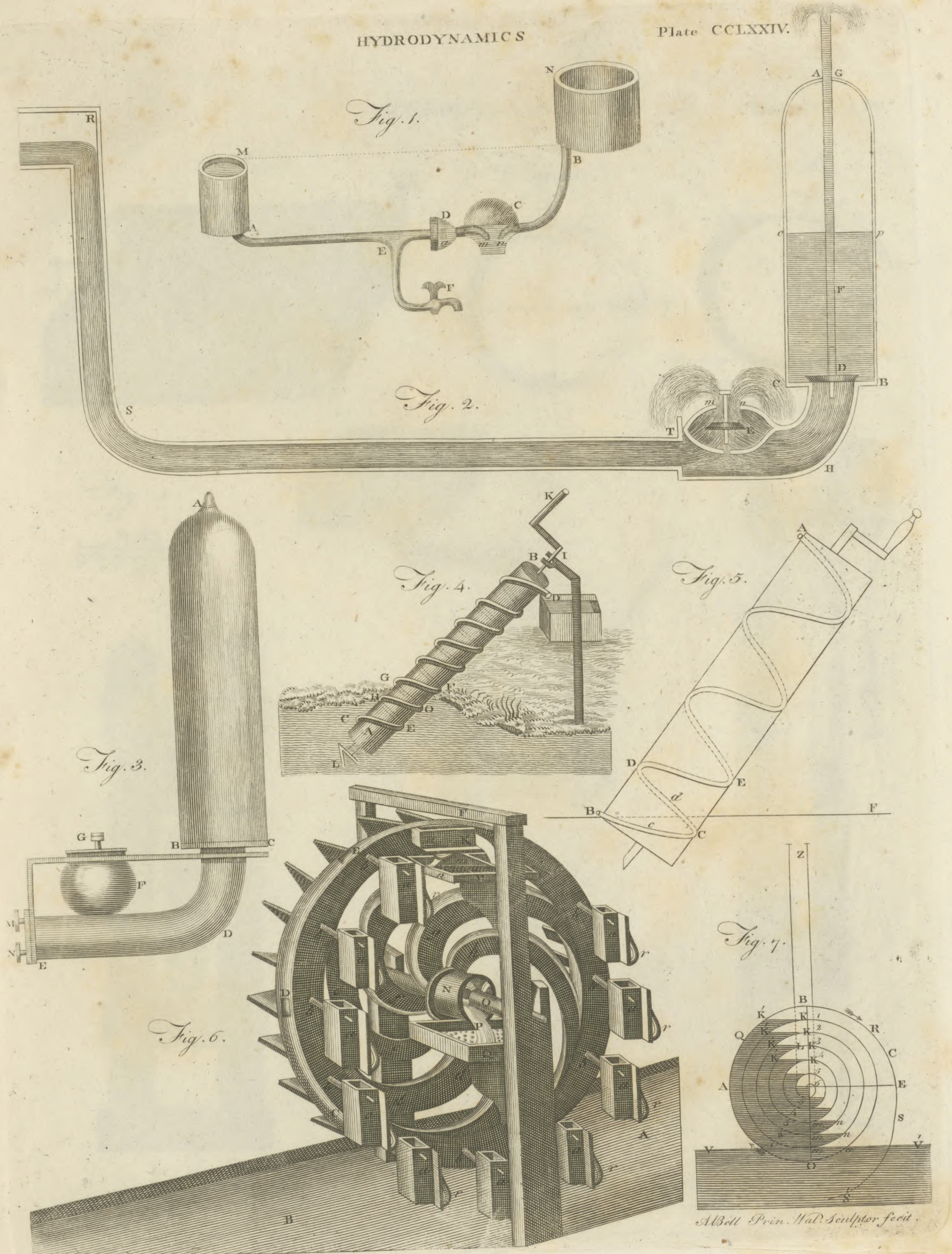

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Fig. 1.

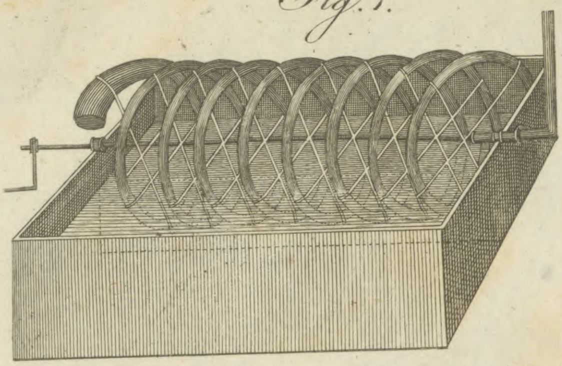
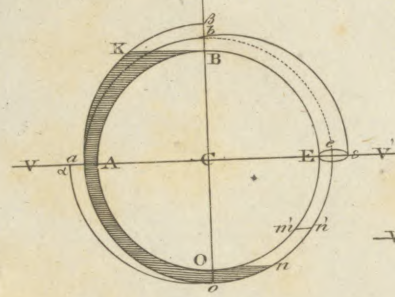


Fig. 2.



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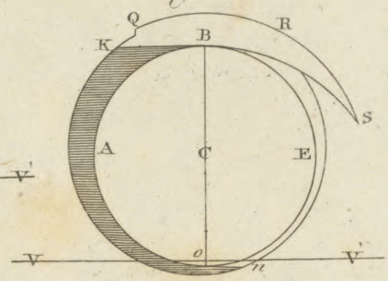

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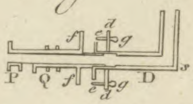

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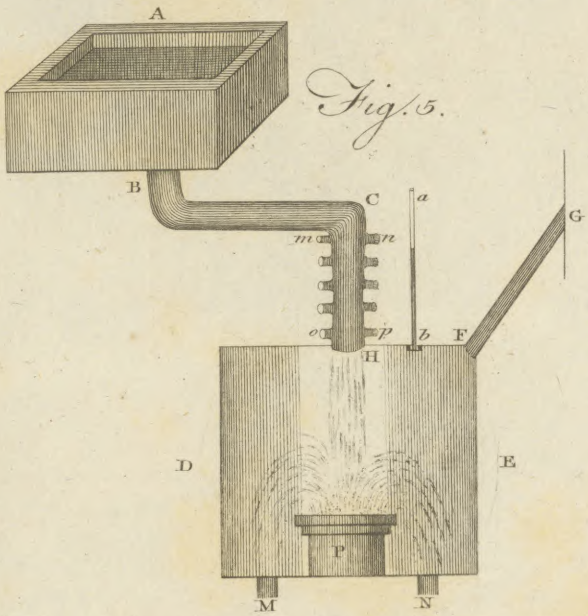

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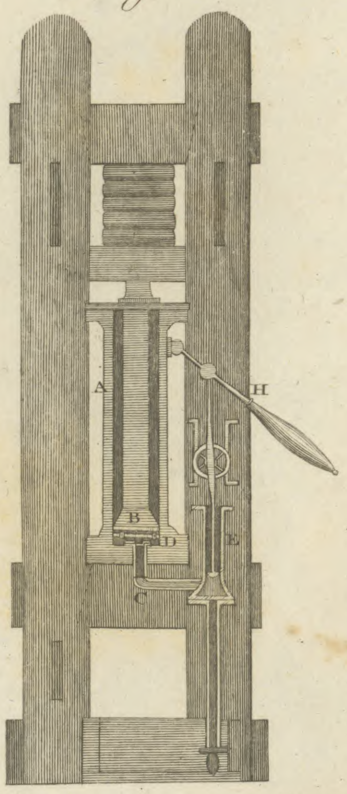

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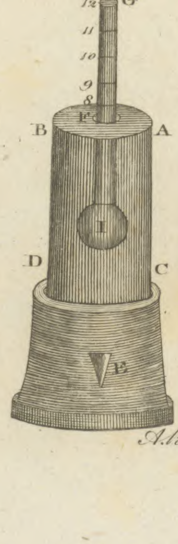

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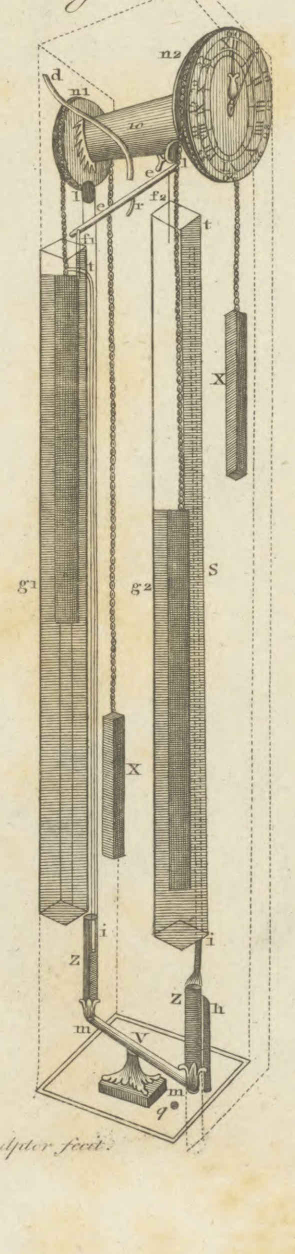

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